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HERNIAS OF THE SUPRAVESICAL, INGUINAL, AND LATERAL PELVIC FOSSAE: THEIR DIAGNOSIS, CLASSIFICATION, AND RELATIONSHIP

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WE have yet to realize our aspiration for an ideal operation for all hernias. True, there are certain standardized surgical maneuvers which have become inseparably associated with the radical cure of hernia and from which, through long usage, it is difficult for the surgeon to divorce himself. Ranking importantly as a causal factor in hernia repair is the failure to recognize coexisting preclinical hernias and to take steps to correct them in conjunction with the major weakness.

The magnitude of the problem of hernia as a cause of disablement can be gleaned from a most comprehensive report published in 1938 by the United States Public Health Service. This survey comprised 800,000 families, including 2,800,000 persons residing in rural areas and in cities. A statistical study of a group of twenty chronic diseases revealed that hernia was the fifth most common finding and the average number of days lost from work or usual pursuits because of it was 13. It is probable that disablement from hernia would exceed this ratio in a large industrialized community. In the 1947 annual statistical report issued by the Industrial Commission of Ohio, compensation was allowed for 4,411 inguinal hernias with a total of 212,239 days lost from employment.

This incontrovertible evidence has mellowed the prevalent optimism toward hernia and given impetus to the increasing interest shown in the clinical and technical application of anatomical knowledge in overcoming congenital, acquired, or both types of structural aplasia of the abdominopelvic parietes. While the literature abounds with articles which deal with the surgical repair of the commonly encountered types of hernia, there is a significant lack of references on the correlative relationship of hernias of the supravesical and inguinopelvic fossae.

On critical a nalysis of the most frequently employed surgical procedures, it is clearly evident that technical advances have been confined chiefly to correcting an obvious, solitary, external weakness without adequate attention to the recognition of bizarre, unrecognized, or multiple coexisting defects in the floor, and, perhaps more importantly, to incipient hernia in its foveal or preclinical stage. Too often, supravesical fossa and other collateral hernias are considered etiologically, diagnostically, and ther apeutically as being unrelated to external inguinal h ernia, which obviously is an erroneous assumption. Because of this prevailing attitude, there is a propensity to dogmatize, or perhaps stylize, certain reparative maneuvers instead of rationalizing or individualizing them. A wellspring of error seems to arise from failure to take cognizance of the existence o

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a more comprehensive hernia-bearing field. The new anatomical concept comprises all intracanalicular as well as neighboring extracanalicular hernias. By this composite approach to the many hernial variants of this region, there is greater likelihood of reconciling many divergent views in technical strategy. The attainment of this ideal in hernial surgery requires a wider dissemination of the importance of knowing well the anatomy of the inguinopelvic region, the causative factors of hernia, and a more exact classification of hernia in relation to the various fossae.

The name "inguinopelvic region" is generally accepted as the most descriptive and inclusive term for this anatomical unit. It comprises the (1) supravesical, (2) middle inguinal, (3) external inguinal, and (4) lateral pelvic obturator and sciatic fossae.

The existing classificational confusion of hernia may be attributed to: (1) variations in anatomical terminology; (2) the general acceptance of two major types of hernia, depending on whether the hernia is internal or external; (3) the overlapping or easily displaceable foveal boundaries; (4) failure to recognize that a hernia may be both internal and external, arising initially in either the internal or middle inguinal fossa, and (5) an erroneous surgical heritage in which the inguinofemoral and supravesical regions have been considered as adjacent, independent units instead of a composite anatomic unit.

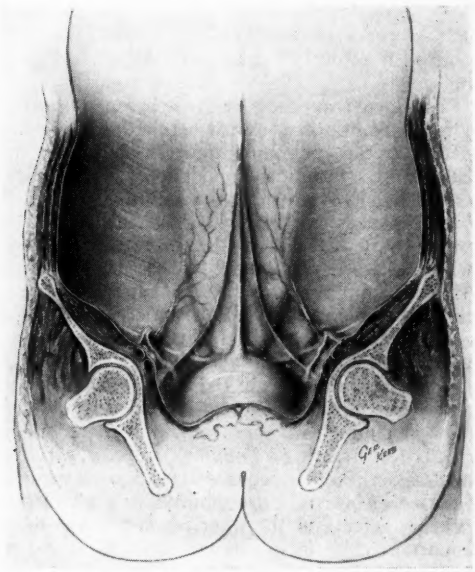


Fig. 1. Composite of inguinal fossae. Coronal section illustrating the three inguinal fossae: (1) the internal inguinal or supravesical fossa is bounded by the urachus medially and laterally by the hypogastric remnant, that segment of umbilical artery which is distally obliterated in the adult, and inferiorly by the peritoneal reflection from the fundus of the bladder; (2) the middle inguinal fossa is limited by the obliterated lateral umbilical artery and inferior epigastric vessels, respectively; and (3) the external inguinal fossa occupies the area lateral to the inferior epigastric vessels and medial to the ilioumbilical line.

It would be desirable and perhaps the ultimate goal to classify hernias so that their name would indicate (1) the predisposing saccular, mural, or foveal anomaly, (2) the intraperitoneal exit, (3) the direction taken by the hernia, (4) the mural structures traversed, (5) the external exit, if an external hernia, (6) the number of loculations, indicating their embryonic relationship, and (7) the contents of the sac and its reducibility. Our medical colleagues have succeeded admirably in achieving this objective in the classification of diseases of the heart. Unfortunately, such an evolutionary classification of hernia, embodying all the prerequisites as enumerated, is not attainable in our present horizon. Consequently, it would seem wiser to exercise prudence by adhering to the process of gradually eliminating certain erroneous legacies of nomenclature to keep step with progress in anatomical and surgical knowledge.

Perhaps a clearer understanding could be gained by considering each fossa as a unit and classifying, preclinically or in their incipiency, the various types of hernias, in contrast to the conventional surgical classification which connotes the exit, direction, and loculations of the sac without regard to the fossae. It is not proposed to divert attention from the long recognized concept of hernias but to supplement our knowledge by correlating the foveosaccular, vesicosaccular, and parietosaccular relationships as they are traced to their destiny as either internal, external, or combined hernias.

THE SUPRAVESICAL OR INTERNAL INGUINAL FOSSA

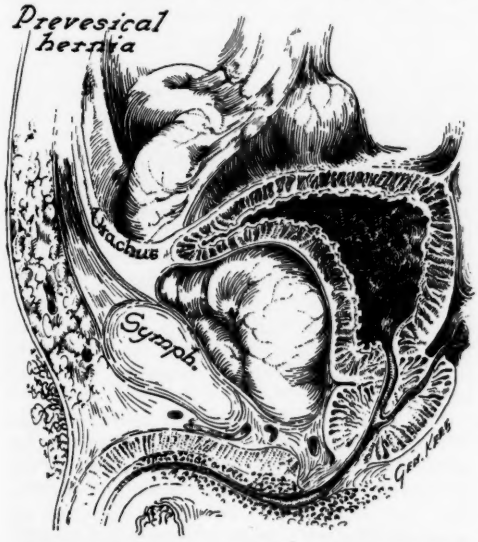
There is general accord on the lateral boundaries of the supravesical fossa, which comprises that large triangular area in the hypogastrium lying between the lateral umbilical arteries, or folds, with its apex at their convergence, the umbilicus. Disagreement stems from interpretation of the lower or inferior boundary. Tinker, Waldeyer, Berson, Warvi and Orr have proposed, and most authorities have accepted, the reflection of the peritoneum from the anterior abdominal wall to the fundus of the bladder as the inferior limit of

the fossa. As opposed to this concept, Pick proposed the extension of the base of the fossa into the true pelvis, marked by the blending of the lateral folds with the peritoneum. Coincidentally, it has been pointed out that the level at which these folds disappear is many times not only obscure but variable, and to accept the latter interpretation would likely lead to greater confusion. The latter deeper fossa of Pick includes the rectovesical fossa in the male and the vesicouterine fossa in the female. Another source of confusion arises from the fact that the supravesical fossa is divided by the urachus or middle umbilical fold into right and left parts with the result that not infrequently the term supravesical is used to indicate either the larger or smaller fossa. Illustrative of the existing confusion of nomenclature of this fossa, Warvi and Orr scanned the literature and discovered that 22 different names had been applied to this fossa. Naturally, one is left in a quandary as to which of these names should be adopted. Joessel and Luttelmann introduced the term, internal inguinal fossa, which is consistent with the conventional recognition of middle and external inguinal fossae and incidentally is in keeping with the evolution of our knowledge of herniology. The universal acceptance of supravesical and internal inguinal synonymously as the correct nomenclature for this fossa, with deletion of the other twenty names would resolve much of the existing confusion and consequently lead to a clearer understanding of the fossa.

Hernias of the supravesical fossa are either internal, external, or combined. The hernias which are intimately related to the vesica urinaria are initially internal. They are not manifest on inspection or by palpation and are only suspected by the character and localization of pain, usually with concomitant symptoms of bowel obstruction, by distortion of the bladder on the cystogram, or by observation of intravesical bulging on cystoscopic examination. Consequently, internal hernias, unless they have migrated externally, are rarely correctly diagnosed preoperatively.

Internal supravesical hernias may be divided according to their relationship to the bladder into (1) prevesical, (2) supravesical, (3) paravesical, and (4) lateral.

In the prevesical type the hernial mass is found in a peritoneal pocket which protrudes through an orifice between the fundus of the bladder and the symphysis pubis (space of Retzius). The resistant, overlying, suprapubic wall precludes its palpation or any visible surface distortion of the wall. The width of this space is limited to the



Figures 2 to 5, inclusive, illustrate the supravesical or internal inguinal fossa.

Fig. 2. Prevesical hernia: a loop of bowel has wedged its way through a peritoneal defect and settled in the space of Retzius, between the bladder and the symphysis pubis.

Fig. 3. Supravesical hernia. The herniation is preceded by an embryonic defect in the urachus or adminiculum triangularis through which a loop of bowel passes. Depending upon its size, the hernia may produce pressure on the superior aspect of the fundus of the bladder.

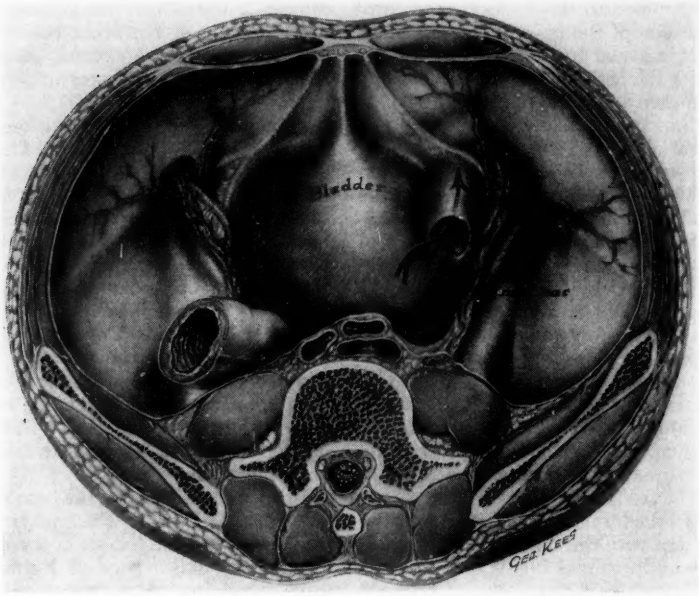


Fig. 4. Paravesical hernia. Cross section of the pelvis at the fifth lumbar showing a composite of the anatomical relationship of the pelvic structures. An arrow points to a peritoneal hernial pocket of the bladder wall in which incarceration and possible strangulation of the imprisoned bowel may occur. Only 1 hernia of this type was found in our series of 4,500 hernia repairs.

lateral margins of the bladder and its depth may extend to the prostate. Its size varies from a small hiatus to a pouch containing 8 feet of bowel (Hulke). The presence of an associated hypogastric, interstitial, or inguinal hernia should make one more suspicious of the possible existence of other herniations in the inguinopelvic region. Fromme is reported as having correctly diagnosed preoperatively a prevesical hernia on cystoscopic visualization of a bulging of the anterior vesical wall. Ordinarily, one would expect a higher incidence of prevesical hernias in the female because of the inordinate stretching of the lower abdominal wall incident to pregnancy, but Warvi and Orr, in their statistical studies, reported a greater incidence in males. They ascribed it to anatomical variations in the male as contrasted with the female pelvis and to physiological variations in filling of the bladder. It has also been observed that in the obese who have lost considerable weight the median and lateral umbilical ligaments become more prominent and in effect deepen the fossae with resultant propensity toward diverticular formation. Finsterer has insisted that abnormality in the regression of the fetal structures plays an important role in the genesis of foveal hernia.

Prevesical hernia is exceedingly rare. Watschugoff found three internal supravesical hernias in 1,500 hernia operations and estimates the incidence as being 0.2 per cent of all hernias. In our series of 4,000 inguinal hernias, all in males, a hernia of the prevesical space has not been encountered. However, the author saw in consultation a woman who had had three previous operations for a suprapubic herniation, which at operation communicated with a coexisting, prevesical hernia.

The treatment of prevesical hernia consists of closing the hiatal defect, internal herniotomy after reduction of the hernia, and repair of any associated mural weakness. According to Kronlein, the mortality rate is lower in the cases approached through a median section and is applicable to the internal or the combined hernias of this fossa. If by chance there should be a coexisting middle fossa hernia, it may necessitate a supplemental inguinal exposure.

Supravesical hernia occurs at the superior aspect or apex of the bladder. The protrusion begins in the supravesical fovea or perhaps in an anomalous defect of the urachus. It burrows its way intravesicalward by compressing the dome of the bladder subjacent to the adminiculum linea alba.

It differs from hernias in the prevesical space in its direction and in its higher position in relation to the fundus of the bladder. Such a hernia should be suspected in any anomalous development of the urachus, the anterior abdominal wall, or bladder. These hernias are more likely to be discovered by the urologist unless the patient should develop a sinus communicating with a patent urachus or symptoms of strangulation. The closure of the defect with the excision of any existing sac or tract is reportedly sufficient for a cure.

Paravesical hernia has its origin in a foveal depression in the serous covering of the lateral wall of the bladder. In its incipiency the pocket is small but grows by the expanding action of a knuckle of bowel aided by concentration of the intra-abdominal pressure. Occasionally the hernial mass may dissect its way lateralward until it presents as an external hernia in the medial angle of the funicular canal. When this obtains it is more easily diagnosed and in effect is a combined internoexternal supravesical hernia. The repair of such a hernia lends itself to the inguinal approach. The paravesical orifice may be sutured through this exposure followed by any indicated reparative measures necessary to effect a taut and resistant floor. We encountered 1 paravesical hernia in our series.

Hernias in the lateral, supravesical fossa occur in the triangular space which lies between the outer border of the rectus muscle, which corresponds closely to the lateral convexity of the bladder and the lateral umbilical fold. A variable portion of this space, depending upon the inconstant position of its boundary, has superimposed upon it the medial and most vulnerable part of the inguinal canal. Hernias through this portion of the fossa are generally external and are only related to the bladder by reason of the contiguous peritoneal reflection of the caudal component of the direct sac.

The types of hernia that make their exit through the lateral space are: (1) direct hernia through the internal inguinal triangle, (2) interfascial semilunar line protrusions, (3) and hernias through the cephalad portion of the canal.

A direct hernia occurring in this particular area may be due to a diverticular outpouching of the vesical wall or of the mucosa. It is difficult to distinguish it clinically from the ordinary direct

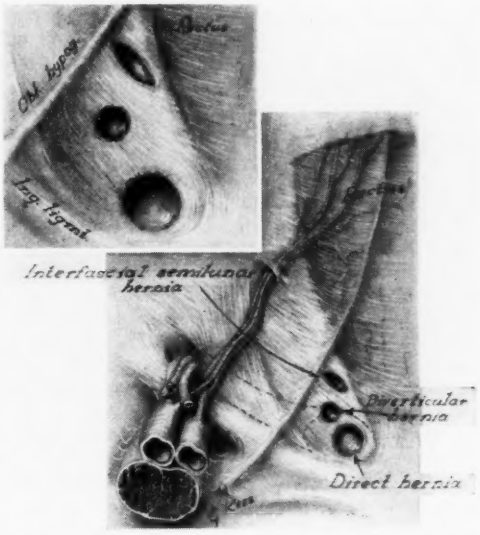


Fig. 5. Lateral to the border of the rectus muscle and medial to the obliterated umbilical artery is a triangular area which corresponds closely but not identically with the internal inguinal triangle. In this triangular zone three vulnerable areas are illustrated, through which a hernia may make its exit: (a) the fascia transversalis of the medial end of the floor of the canal, which is subjacent to the pubic spine (incipient direct hernia); (b) a rent in the cephalad portion of the canal (diverticular hernia), and (c) the fascial margin of the semilunar line (interfascial semilunar line hernia).

domelike bulging commonly arising in the medial angle of the canal. A history of two-step urination with concomitant spontaneous reduction of the bulging, particularly if repetition is observed, is a significant diagnostic sign; confirmation by cystography clinches the diagnosis. At operation the neck of the sac will be found to be quite sharply outlined and to lead inferiorly and medialward, in contrast to the superomedial direction of the classical direct hernia.

The protrusions which occur through the fascial portion of the semilunar line should, for the sake of clearness, be termed interfascial, but they are generally known as "spigelian" hernias. These hernias are seldom encountered below the semicircular line of the abdominal wall.

Hernias through small rents or well defined fascial defects in the cranial portion of the canal have been designated by Burton and Blotner (5) as diverticular inguinal hernias. These aberrant loculations of the sac present a characteristic narrowing and in some instances there is obliteration of its lumen at the transparietal juncture.

These authors reported an incidence of 2.6 per cent in 2,302 primary hernia operations and of 13.8 per cent in 130 recurrent hernias which included the communicating, noncommunicating, and adipose types of diverticular hernia. This significant disparity in incidence is explained on the basis that many of these incipient sacculations are not searched for and consequently are overlooked during the initial repair.

The boundary separating the semilunar line and the cranial portion of the funicular canal has not been accurately defined anatomically and still remains arbitrary. In general, the semilunar line is recognized as a line occupying a zone parallel and adjacent to the lateral border of the rectus sheath, which is at the conjunction of the fascial and aponeurotic components of the transversus abdominis. The cranial portion of the canal lies between the semilunar line and the central portion or bed of the canal. The latter is exclusively fascial and therefore less dense and more vulnerable than the aponeurotic semilunar line zone.

THE MIDDLE INGUINAL FOSSA

That portion of the lateral pelvic concavity occupying the space between the vestigial umbilical artery medially and the inferior epigastric vessels laterally has long been recognized as the middle inguinal fossa. Because of the ease of displacement of its boundaries, it is inconstant in size. The middle fossa differs from the internal in that it is smaller, lies wholly within the inguina, and hernias through it are for the most part external, although they may be combined. As a rule, they can be seen and felt and are therefore easily diagnosed preoperatively. Occasionally hernias of this fossa will transgress their conventional medial boundary and lodge in the lateral portion of the supravesical fossa.

Three types of hernias may be encountered in this fossa: (1) direct hernia through the middle inguinal triangle, (2) interaponeurotic semilunar line hernia, and (3) interligamentous hernia.

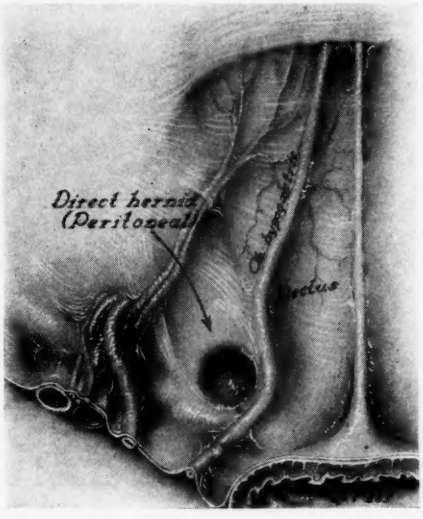
1. Direct hernia characteristically has its origin in the deepening and circumferential expansion of that portion of the middle fovea which lies beneath the inguinal canal. Progress of the herniated mass is influenced by intra-abdominal, intraenteric, or both types of pressure, gravity, traction, peristaltic action, and, more importantly, by coexistent diminished tone of the mural structures. In the concomitant enlargement of the middle fossa the lateral umbilical fold is displaced medialward until it may ultimately rest behind the pubic spine. Simultaneously, the epigastric vessels may be pushed lateralward until they lie adjacent to the internal abdominal ring. Should the latter alternative occur, the external inguinal fossa would become proportionately diminutive in size. The clinical application of the knowledge of the variability of these fossae concerns the surgeon chiefly as regards the relationship of the bladder to direct inguinal hernia. Hoguet and Wilkie have drawn attention to the variants of the direct sac, the former by emphasizing the technique of freeing the sac from the bladder and the latter by classifying the vesicosaccular relationship.

The three types of direct hernia are (1) peritoneal, (2) peritoneovesical, and (3) vesical.

In the exclusively peritoneal variant, the bladder is not adherent to the sac. The relationship is one of contiguity only. The sac conforms to the morphologic weakness of the wall and is therefore dome-shaped and wide-necked. It almost never strangulates. The sac plays a secondary role to the pre-existing congenital mural weakness. Moreover, its correction is a more formidable procedure than is required for an indirect hernia. A single locule may be present or it may represent the direct component of a saddlebag or bifurcated sac.

In the peritoneovesical or paraperitoneal type, the wall of the bladder is adherent to the sac. As has been emphasized by Hoguet, it is essential to mobilize the sac well so as to obviate any tenting of the peritoneum with resultant formation of an incipient cul-de-sac to lead to a recurrent hernia. If the ligature is applied in the suprasaccular zone of peritoneum with the latter under tension, there will result an incurvation or dimpling instead of a conical stump. This observation of Russell (35) is an important one.

Statistically, Eccles reported that 1 per cent of all hernias were adherent to the bladder; Becker reported this finding in 25 per cent. Wilkie found 16.3 per cent of all the hernias and 50 per cent of the direct hernias which he observed had a paraperitoneal relationship. By far the largest series was reported by Garner, comprising 2,643 hernia repairs done at this clinic. In 1,278, or 49 per cent of the cases, the bladder was dissected 2.5 cm. or more from the direct sac or direct component of the bilocular sac. In this series the bladder was accidently opened six times during the mobilization of the sac. Five of the patients had a smooth convalescence, but an abscess developed in the prevesical space in 1 patient and required drainage. It has been our practice to insert an indwelling catheter for a few days in all cases in which the bladder was accidentally opened. By following steadfastly Hoguet's technique of retrogressive removal of the sac, there is much less chance of inadvertently entering the bladder. This



Figures 6 to 11, inclusive, illustrate the middle inguinal fossa.

Fig. 6. The middle fossa is the site of most direct hernias. They generally occur at the base of Hesselbach's triangle. There are three types, depending upon the relationship of the sac to the bladder: peritoneal, peritoneovesical, and vesical. The type shown in this illustration is exclusively peritoneal.

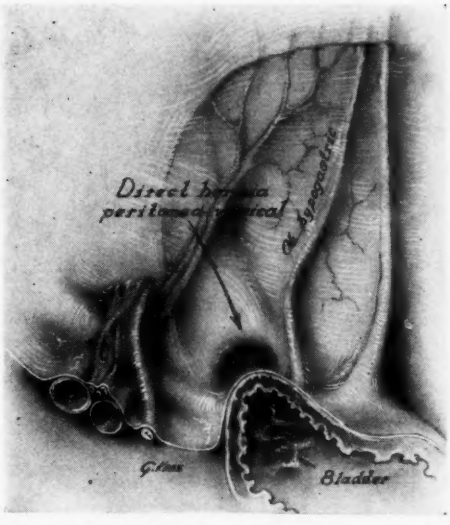


Fig. 7. The second and most frequent type of direct hernia is the peritoneovesical. In this type the vesical wall is adherent to the sac and must be freed in the complete mobilization of the sac and before high ligation.

technical maneuver of Hoguet is of paramount importance in dealing with recurrent hernias in which direct sacs predominate.

The protrusion of the vesical wall through the base of Hesselbach's triangle without any serous covering represents the third departure of direct hernia. As a rule there are associated urinary symptoms and a meticulously observant patient may notice disappearance of the hernia after micturition but reappearance with filling of the bladder; such a history, if dependable, is pathognomonic. An impulse on coughing is likely to be equivocal or absent. A cystogram may confirm the diagnosis preoperatively. By adhering to the rule of retrogressive removal of the sac, it will be found that the herniation is extraperitoneal, which is the final link in establishing the diagnosis of an external vesical hernia. Incidentally, the repair of the wall is no different from that required for other direct hernias.

2. Interaponeurotic semilunar line hernia. To fulfill the criterion for this type of hernia, the protrusion must occur through a rent in the aponeurotic component of the transversus abdominis muscle. The defect happens most frequently at the conjunction of the internal oblique and transversus abdominis aponeurosis which is just lateral to the rectus sheath. It traverses that part of the semilunar line which is inferior to the semicircular line of Douglas which is in the middle fossa. The margins of the ring are characteristically sharp and resistant as opposed to the surrounding hiatal weakness which is commonly present in canal hernias. Vascular perforations of the musculoaponeurotic wall, particularly branches of the inferior epigastric artery, have been given etiological significance by the French writers Junet, and Thevenot and Gabourd. However, River feels that these should be considered simply as one of the many predisposing factors, such as inordinate abdominal strain, pregnancy, obesity, muscle atrophy, aplasia, agenesis, or generalized mesoblastic inadequacy, which increase the susceptibility of the parietes to herniation.

3. Interligamentous or inguinopectineal hernia. The anatomical physics of the floor of the canal and of the interligamentous space has been described by Lich and Samson. These investigators made careful measurements of the expansion or elastic coefficient of the wall at different levels of the floor of the canal in response to varying recorded intra-abdominal pressures. These observations confirmed what has long been recognized clinically, that the most vulnerable point in the floor of the canal is medial, parajacent to the

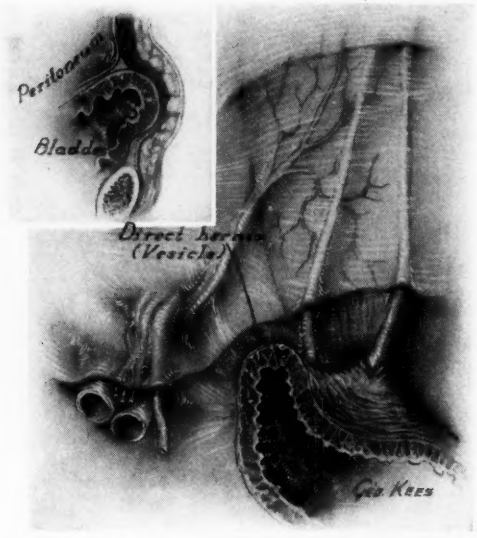


Fig. 8. In the third type, as illustrated, the bladder wall alone protrudes through the floor of the middle fossa (direct vesical hernia); this is the rarest type.

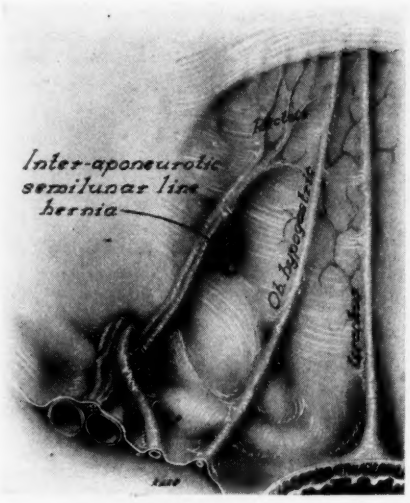


Fig. 9. In the mediosuperior portion of the middle fossa and unrelated to direct hernia is another vulnerable area which is adjacent to the semilunar line but in the aponeurotic component of the wall. A hernia at this point is known as an interaponeurotic semilunar line hernia.

normally placed inferior epigastric vessels. The weakness corresponds to the base of Hesselbach's, or the middle inguinal, triangle and represents the site at which direct hernias are most prone to occur. These authors conceived the idea of a triple dimensional or trihedral space, the boundaries of which are the inguinal ligament, the iliopectineal (Cooper's) ligament, the denser medial margin of the fascia transversalis (generally referred to as the fascial boundary of the floor of the canal), and, in the front, the overlying internal and external oblique muscles. The trihedral space extends from the pubic spine inferiorly, which is its apex, to the external iliac vein laterally. The base of the trihedron is at the greatest divergence of the inguinal and iliopectineal ligaments, which is marked by the passage of the external iliac vein over the superior pubic ramus. The longitudinal measurements of this space are approximately twice the dimensions of its base or vertical portion of the transitional space.

The triple dimensional space consists of two vulnerable components: the interfascial, or floor of the canal, and the interligamentous space, which is situated between the inguinal and iliopectineal ligaments.

The interfascial space, or floor of the canal, with its protean weaknesses and variants of the sac are well known. In contrast, the vulnerability of the interligamentous space and the importance of its closure or reinforcement in the treatment of combined weaknesses have received appreciable surgical recognition in only the last 2 or 3 decades. Too often there is a tendency of the surgeon to think of femoral hernia as the only saccular variant that comes through the interligamentous space by way of the femoral canal. However, Wilmoth, Garner, and Burton (4) have pointed out that a loculation may present in front of the femoral vessels by insinuating itself beneath the inguinal ligament, this being the prevascular type. It should be differentiated from departure of the femoral locule lateralward and occasionally overlying, subinguinally, the femoral vessels. When there is attenuation and diffuse bulging of the lacunar ligament the condition is known as a pectineal hernia. In the event that there is a vertical tear in the lacunar ligament and the hernia, which is usually diminutive, passes through the rent, it is designated as a translacunar hernia. Should there be more than one loculation appearing simultaneously through the interligamentous space, the condition is referred to as a multilocular hernia. It is possible for the femoral ring to become widened medially so that a femoral hernia may have a wide neck, not unlike the pectineal type, or the sac, after passing through the femoral ring, may become diverted laterally and

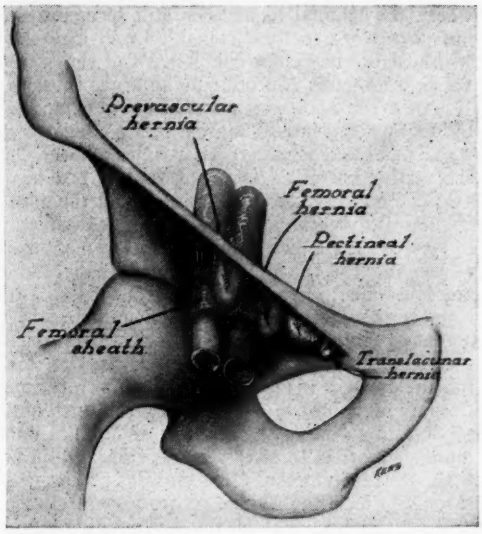


Fig. 10. Any hernia emerging through the space between the inguinal and iliopectineal ligaments is referred to collectively as an interligamentous hernia. If the protrusion is in front of the external iliac vessels it is prevascular, if it comes through the femoral ring it is femoral, if there is attenuation of the lacunar ligament allowing diffuse bulging it is pectineal, and if the hernia is through a rent in this ligament it is a translacunar hernia. When simultaneously multiple sacs are present they are called a multidiverticular hernia. In this diagrammatic drawing are seen these interligamentous saccular variants.

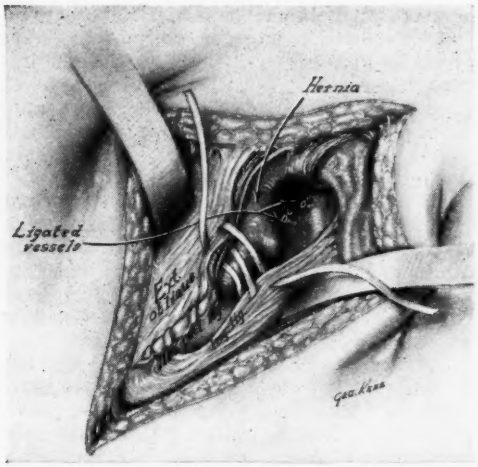


Fig. 11. The transitional or infundibuliform space is illustrated. The three parietal laminae, the fascia transversalis, and the internal and external oblique muscles are picked up simultaneously in the same bite of a running fascial suture and approximated jointly to the iliopectineal ligament (Cooper's), beginning at the pubic spine and continuing lateralward to the external iliac vein. At this point of the transitional space the suture must necessarily leave the iliopectineal ligament and attach the same parietal layers to the recurved portion of the inguinal ligament and the adjacent femoral sheath. The sac as shown is bilocular with one locule emerging through the interligamentous space; the other is directed upward at the mesial border of the external iliac vein. To preclude this vulnerability, meticulous care in placement of the suture at this point is essential. The suture forms a living filigree.

simulate simultaneously many interligamentous variants.

For the sake of statistical accuracy, the exact type of saccular variant should be correctly stated on the operative record. It is unlikely that the different types of peritoneal sacculations of this space can be differentiated preoperatively. For that matter, only a small percentage of hernias through the floor of the canal are correctly diagnosed antedating operation. It is of utmost importance to remember that any sacculation through the interligamentous space constitutes an absolute criterion for the "three dimensional" or combined inguinopectineal repair.

Recently, we encountered an unusual aberrancy in which a femoral sacculation presented with two ostia. This anomaly fortunately was recorded photographically in color. The cause of inguinal hernia has long been resolved, but disparity of opinion still exists in regard to the genesis of interligamentous loculations of the peritoneum. An unusual embyronal departure was reported by Fauntleroy, in which the cord made its exit through the femoral ring. Quilliam discovered an indirect inguinofemoral hernia in contrast to the recognized and characteristic inguinofemoral sac. With Wilmoth and Garner reporting other saccular variants through the interligamentous space and from our confirmatory experience, it would seem that evidence is accumulating in favor of a congenital origin of these locules. In reality, they may be considered as secondary or evolutionary variants of parent inguinal sacs.

THE EXTERNAL OR LATERAL INGUINAL FOSSA

Ordinarily, in surgical parlance, the external fossa is referred to as an entity less often than either of the other inguinal fossae. Perhaps this lack of recognition is accounted for by the fact that this fossa is quite shallow. Its boundaries have not been stressed and for the most part there is only one hernia of significance that is encountered in it, i.e., the indirect; however, it is an anatomical fossa with distinct boundaries. Laterally

it extends to the ilioumbilical line, inferiorly to the inferior epigastric vessels, medially to the sheath of the rectus, and posteriorly to the iliopsoas muscle, the external iliac vessels, and the recurved portion of the inguinal ligament. Since the anterior parietal wall of this fossa contains, in addition to the internal abdominal ring, several laminal junctures and embryonic parietal variants which represent potential sites of weakness or increased susceptibility through which hernial protrusions may occur, it seems advisable for the sake of a clearer understanding to discuss them under the following types: (1) indirect hernias; (2) semicircular line, interparietal, and interfascicular hernias; and (3) transitional space hernias.

Indirect hernia is initially urogenital in origin with a coexisting, unobliterated vaginal process of peritoneum forming the sac. Other predisposing factors in its development are (a) circumferential mural weakness, (b) increased intra-abdominal tension, (c) muscle contraction, (d) gravitation, (e) intraluminal tension, and (f) traction of the gubernaculum. The latter applies to a sliding hernia. An indirect hernia is exclusively an external hernia, and so long as it remains unilocular, it is not intimately related to the bladder or to other hernias of the inguina. This relationship of the indirect sac is not altered by its descent through the transparietal portion of the canal to its ultimate, but infrequent, destination, the scrotum. An indirect hernia differs from other inguinal hernias in that the floor of the canal separates it from the vesical wall. Another variant peculiar to this hernia is that it may have contained bowel which may possess an aperitoneal surface, the bowel forming a portion of the wall of the sac. While such a hernia is actually indirect, it is better known as a sliding hernia because of its congenital enteric relationship. Most colossal scrotal hernias are of this type. With increasingly more thorough mobilization of the sac, which is now being practiced, more loculations of the sac are encountered and similarly a higher incidence of sliding hernia, which incidentally explains the statistical variations of the latter from 1 to 5 per cent.

Semicircular line, interparietal, and interfascicular hernias. These three hernial variants, although closely related anatomically, may be due to a variety of structural deficiencies of the musculoaponeurotic layers of the ventral inguinal wall. They occur in a zone superolateral to the internal abdominal ring following an arc which begins at the junction of the semicircular and semilunar lines. It passes through the parietal components lateral to the triple conjuncture where the laminal identity is still recognizable, but parajacent to their transition and including within it the fascicular components of the transversus abdominis and obliquus internus muscles. Whether the accessory internal oblique muscle, by augmenting lateral muscle pull as suggested by Chouke and Zimmerman *et al*, is a factor in the production of an incipient rent is problematical. Since hernias at the juncture of the semicircular and semilunar lines occur so seldom, and in view of the frequent variations in the fascicular development of the internal oblique muscle, there are consequently no statistical data available to support or refute the possible etiologic role of the accessory internal oblique muscle. Normally, there is no hiatal defect in the semicircular line, but the aponeurosis is attenuated at its transition from a unilaminar to a bilaminar structure which renders this area of the anterior abdominal wall more susceptible to stress arising from within or without the abdomen. The margins of the ring through which the hernia protrudes are clearly defined, resistant, and with no surrounding mural weakness as contrasted with the usual parietal laxity, particularly in direct and large indirect hernias.

Interparietal herniations occur lateral to the sheath of the rectus muscle but mesial to the muscle components. The cause of hernias at the musculoaponeurotic transition is obscure; some workers attribute them to defective embryogenesis. Scopinaro reported an autopsy of a 6 day old infant with a strangulated spigelian hernia. A vascular perforation through the transversus abdominis muscle by the lateral branch of the inferior epigastric artery, which lies in front of the fascia transversalis, is a potential site of exit of an interparietal hernia. Koljubakin, Derycke, Junet, Lobello, and Papin have verified anatomically the presence of this arterial branch and the fact that it may traverse one of these apertural defects, which may subsequently expand into a hernial ring; however, such an evolutionary relationship has been observed to occur inconstantly. River, who reported 4 cases of spigelian hernia, does not share the vascular perforation theory and believes that it is of remote etiologic importance.

The hernial protrusion may pass through a rent in the innermost parietal layer, the transversus abdominis, and become arrested at this level; or it may traverse the second parietal stratum, and the obliquus internus, but it has not been observed to penetrate the external oblique lamina.

These junctional, semicircular, semilunar line, and interparietal hernias are variable in size and may contain omentum or loops of small or large

bowel. One of River's cases was a spigelian sliding hernia of the sigmoid.

A third type of ventral inguinal hernia is the interfascicular, which has been described by Zimmerman *et al.* He demonstrated gaps between muscle bundles which are bridged by thin, adjacent, investing fascia and may contain fatty deposits. It is these interfascicular areas which are susceptible to the development of herniations. This type of fascicular aberrancy occurred in 109, (21.8%) of 500 halves of dissected cadavers (46). To the author's knowledge, the clinical incidence of this type of hernia has not been reported. The interstitial changes may involve the deep or the intermediate parietal layer, or both layers. Similarly, the herniations may be single or multiple. These hernias differ from other hernias of the inguinoventral area in the following manner: usually they are not palpable, especially in the obese; they are not reducible; they transmit no impulse; they do not strangulate; they are insidious; there is no palpable mural defect; they may be composed of fat; and they are translaminal, in contrast to transparietal, and consequently they are frequently referred to as prehernial lipomas. Because of their clinical features, they must be differentiated from benign tumors of the abdominal wall, fibromas, lipomas, organized hematomas, cysts, neurofibromas, and leiomyomas. Fortunately, this type of ventral inguinal (spigelian) hernia is exceedingly rare; in fact, its true identity may remain in doubt until exposure at operation.

Transitional space hernia. With the introduction of the modern technique of iliopectineal (Cooper's) ligament repair, mainly through the contributions of Lotheissen, Dickson, McVay and Anson, Payne, Harkins and Swenson, Seelig and Tuholske, and Burton, it soon became evident that it, too, had a critical point of weakness, and that successful repair depended, for the most part, on the strategic closure of the transitional space. This vertical space is subjacent and caudal to the internal abdominal ring. It is situated at the level of the external iliac vein where it crosses the superior pubic ramus. In reality, it is the base of the trihedron, which coincidentally is the widest diversion of the components of the triple dimensional space. The effective closure of this vulnerable spacial weakness is the most exacting and important maneuver of Cooper's ligament repair. In order to reinforce or obliterate this space, it is necessary to change from the deeper parietopectineal repair to the more superficial parietoinguinal reparative level. In this transitional step of the operation there obtains an intermediate quadruple relationship (inguino-pectineo-parieto-vascular conjunction.) In this combined repair, the iliopectineal ligament serves as a common anchorage for the fascia transversalis, singly or jointly for the medial leaf of the external oblique aponeurosis, and for the inguinal ligament. Usually, no difficulty is encountered in approximating the former structures, but, because of the wide interligamentous gap and the dense and unyielding ligaments, it may be impossible to approximate them laterally, so that this space must be bridged with a living fascial suture to form an aponeurotic filigree; or another alternative maneuver is to turn down the lateral aponeurotic flap and tack its edge to Cooper's ligament. The internal exit of a transitional space hernia is either through the enlarged internal abdominal ring or through the inferior interfoveolar component of the fascia

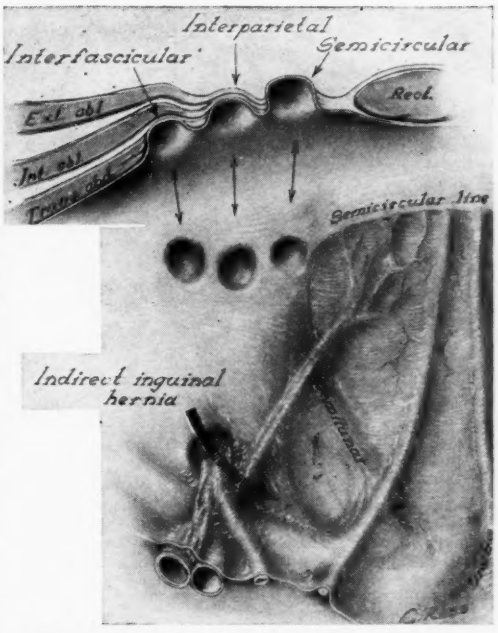
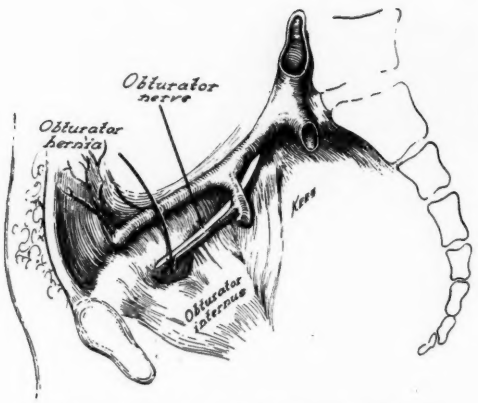
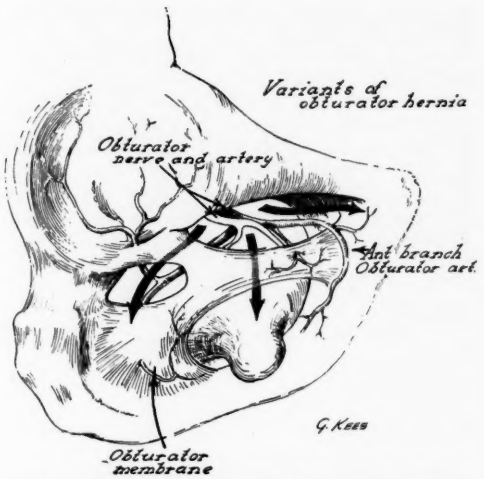


Fig. 12. External or lateral inguinal fossa. The internal abdominal ring is located in the external inguinal fossa. Most hernias occur through this aperture. The arrow illustrates how an indirect hernia may settle in the middle fossa in its downward migration.

In a zone extending lateralward from the junction of the semilunar and semicircular lines are three areas of weakness susceptible to herniation through them. The lateralmost occurs through the transversus abdominis fibers (interfascicular hernia), the middle one occurs in the aponeurotic component of the parietal wall (interparietal hernia), and the medial one is through the transition of the rectus sheath at the fold of Douglas (semicircular hernia).





Figures 13 to 16, inclusive, the lateral pelvic fossa.

Fig. 13. Sagittal section of the pelvis showing the anatomical relationship of the entrance to the obturator canal. The proximity of the obturator nerve to the hernial protrusion explains the frequent association of pain in the region mediated by it.

Fig. 14. Obturator hernia. The three variants of the sac and their points of emergence through the obturator membrane are illustrated. The obturator nerve and vessels can be easily demonstrated during the mobilization of the sac and their position known before the repair of the defect is begun.

transversalis, caudal to the ring and superolateral to the external iliac vessels. Therefore, initially, it may be an indirect hernia, but it differs from it in its course and in that the sac does not arise from a vestigial remnant. After the fascioparietal boundary of the floor has been anchored to the iliopectineal (Cooper's) ligament as far lateralward as the iliac vessels, the overlying arching internal oblique fibers and external aponeurotic flap must of necessity be sutured to the more superficial inguinal ligament. Consequently, with the alteration in the depth of the repair there occurs an underlying potentially weak space through which the hernia must pass. If the hernia progresses, it can only escape through the inferior inguinopectineal portion of the transitional space where it becomes recognizable externally. In our experience, the recurrence rate following autogenous suture has been definitely lower than that following silk suture. An unpublished statistical study of 315 combined inguinopectineal herniorrhaphies supports the gaining enthusiasm for this repair in contrast to other recognized techniques for correcting combined interfascial and interligamentous deficiencies.

PELVIC FOSSAE

There are two lateral pelvic fossae, the obturator and the sciatic. These fossae differ from those of the inguina in that they are surrounded, for the most part, by bony framework, although the herniation is through an aperture in a dense membrane bridging the fossa. Anatomically, they are in juxtaposition to those of the inguina and, peritoneally, they are even more closely related. Obturator hernia must rightfully be discussed in the differential diagnosis of every femoral or pectineal hernia. Consequently, the alert surgeon cannot be too complacent about the correctness of the saccular exit until the neck is completely exposed and the structures surrounding it are identified.

The preoperative diagnosis of an obturator hernia is not easy and is rarely made. Yet, if one would bear in mind certain signs and symptoms, it should be suspected much more frequently than it is. For instance, symptoms of intestinal obstruction with pain radiating down the medial aspect of the thigh to the knee (Howship-Romberg sign), particularly if they occur in an emaciated, elderly individual, are strongly suggestive of an obturator hernia. If, in addition, a tender lump can be felt below and medial to the femoral canal, and adjacent to the lateral border of the adductor magnus at the base of Scarpa's triangle, it is confirmatory. Another valuable diagnostic maneuver is the palpation of a lump on the anterolateral pelvic wall, rectally or vaginally. The absence of any tenderness when pressure is made over the superior pubic ramus or inguinal liga-

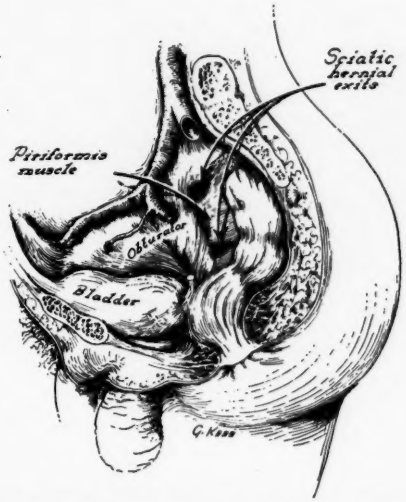


Fig. 15. Sagittal section of the pelvis showing the internal or peritoneal exits of a sciatic hernia. Arrows point to the hiatal defects at the superior and inferior margins of the piriformis muscle. Anteriorly the obturator muscle and the foveal exit of the obturator vessels are seen.

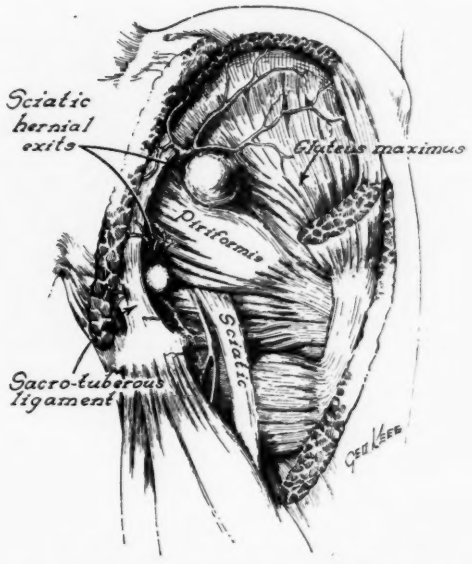


Fig. 16. Sciatic hernia as seen externally at the superior and inferior borders of the piriformis muscle, respectively. Because of the nearness of the sciatic nerve to the inferior sciatic hernia care should be exercised in protecting it from trauma at the time of operation.

ment tends to exclude the possibility of a femoral hernia, which incidentally may coexist and is most frequently confused with obturator hernia. In our experience, totaling the repair of 4,300 hernias in males, there was only 1 diagnosed as obturator hernia. Unfortunately, the patient did not come to operation and consequently the diagnosis was not proved. There was a history of pain which radiated down the medial aspect of the thigh, and mild adductor atrophy, but at the time of the examination there was no demonstrable mass; nevertheless, it illustrates how seldom this type of hernia is encountered in males. Pregnancy is an important factor in the causation of obturator hernia, because of the great increase of intrapelvic pressure. Watson (42) has reported the largest series, in which he found only 44 men (15.27%) among 288 patients. It has also been observed that the incidence of obturator hernia is higher in those between 60 and 70 years of age (38).

In the treatment of obturator hernia one may use either the inguinal or the abdominal approach. The femoral route has been abandoned. In the presence of symptoms of intestinal obstruction, which is usually due to partial incarceration or strangulation of the bowel wall (Richter), the abdominal route is advised. When only a benign hernia mass is present, the inguinal exposure is preferable. Reduction of the hernia with exsection of the sac is considered adequate for cure.

Sciatic hernia escapes through either the greater or lesser sciatic foramen. Watson (43) has divided sciatic hernia into the suprapyramidal, subpyramidal, and subspinous types; in other words, they designate the relationship of the hernia to the piriformis muscle in the greater sciatic foramen. In the subspinous variant the hernia comes through the lesser sciatic foramen. If there is a palpable bulging under the gluteus maximum muscle and it is reducible, the diagnosis is almost certain. Occasionally, the hernial mass may migrate anteriorly above the greater trochanter. Not unlike in cases of other hernias of the pelvic fossa, the diagnosis may remain obscure until at laparotomy a loop of bowel is found lodged in the sciatic foramen, producing obstructive symptoms. An abdominal intrapelvic exposure with the patient in the Trendelenberg position is the accepted approach.

DISCUSSION

In this discourse, the importance of the third dimension in reparative technique has come to the fore, and coincidentally the concept of inguinal hernia has been expanded to include those hernias

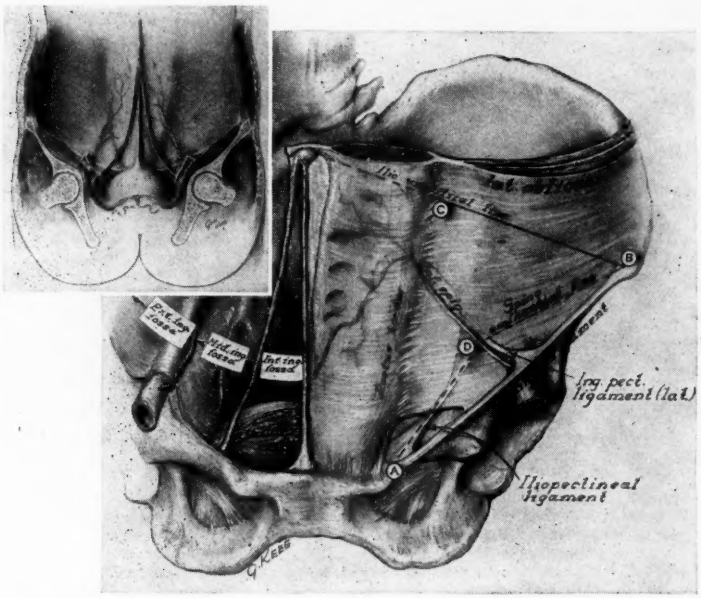


Fig. 17. A composite drawing of the pelvis depicting the triangles of the inguina on one side and the inguinal fossae on the other as they would be approached surgically from without. The insert shows the fossae from within the pelvis or the internal surface of the anterior abdominopelvic peritoneum. This topographical contrast of triangles and fossae permits rapid orientation for surgery and reveals the anatomical evolution and relationship of inguinopelvic hernias.

through the lateral pelvic fossae and ventral inguinal hernias. These hernias may be suprajacent, subjacent, or parajacent to the inguinal canal. More specifically, these extracanalicular hernias occur in the supravesical fossa, interligamentous space, semilunar line, and through the obturator and sciatic foramina. The purpose of presenting the inguinopelvic concept of hernias is to familiarize the surgeon with the different saccular departures which are legion so that he shall be able to recognize the many hernial variants. Moreover, if he possesses at least a working knowledge of their incipiency, from their foveal development until they become clinically recognizable, he should be better qualified to successfully cope with them surgically. Too often we are not sufficiently anatomically-minded, thinking more of the technical aspect, with the result that we fail to recognize the importance of tracing the evolution of canalicular hernias and their relationship to those collateral, potentially weak areas of the wall in proximity to the inguinal canal. For instance, the role of the interligamentous space and the necessity of its exclusion, closure, or reinforcement in the composite technical repair is rightfully receiving more emphasis. Obviously, as already mentioned, there are other comparable but less important vulnerable areas of the inguinopelvic region.

There may be properly considered three important evolutionary phases in the surgical management of hernia: herniotomy, herniorrhaphy, and hernioplasty, including the third dimensional repair. I have previously discussed herniotomy and herniorrhaphy in connection with the evolutional classification of hernial operations (4). The current interest is in hernioplasty and particularly in the deeper, or Cooper's ligament, repair.

Contrary to the principles elaborated by Halsted, which are still fundamental, some surgeons inadvertently created unphysiologic tautness of the fortified wall in their effort to overcome forcibly, major anatomical defects of the floor. As a result, the retentive sutures often cut through the retained structures by the process of progressive ischemia, the components returning to their former relationship. These technical complications were observed with sufficient frequency to lead to unique and ingenious ways of making replacement

of the structures essential to a successful repair. This plastic phase of hernia repair occupies an important place in the surgical management of hernias, particularly those associated with agenesis or acquired distortional defects. Billroth has said, "If we could artificially produce tissues the density and toughness of fascia and tendon, the secret of the radical cure of hernia would be discovered." Hernioplasty comes nearest to achieving this goal by natural means.

Despite great strides in reducing the incidence of recurrent hernia, the search for technical improvements continues. If they appear logical and fulfill sound surgical principles they should receive probational acceptance.

With the seemingly endless number of old and continuing new hernial operations that are described in textbooks of surgery and in the literature, it is no wonder the conviction is growing that the technical phase is all-dominant with the anatomical aspect of hernia becoming recessive. If this current concept continues and anatomical knowledge is relegated to an elementary or subordinate relationship instead of sharing equally in technical advances, an imbalance will eventually become manifest. It is therefore important to subject, from time to time, the various techniques to careful scrutiny in order to avoid the perpetuation of defective technical procedures. The fundamental error in our present day teaching of herniology is the failure to emphasize the necessity for measuring the anatomical weakness against the proposed corrective repair. There are many competent surgeons who are not interested especially in herniology and give little consideration to the interligamentous space or to hernias which do not, strictly speaking, fall within the category of inguinal hernias.

In essence, I should like to make a plea for the return to a precise understanding of the fundamental principles underlying hernia repair. Basic concepts, standardization, and individualization must be integrated in our surgical training programs if we are to attain the hoped for objective. To put it naively, surgical training is being streamlined; the result is that the junior surgeon is being taught to look, but unfortunately he does not always visualize or have an anatomical understanding of the pathway of the hernia from its foveal incipiency, with its usual as well as its bizarre vesical, mural, funicular, and ligamentous relationships before it reaches a full-blown clinical hernia producing economic and industrial incapacity.

In order to orient oneself quickly, Figure 17 summarizes, simultaneously, the external and the internal aspects of inguinal hernias. On one side of the pelvis the various triangles of the inguina (which is the usual method of referring to the external exit of the hernia) are outlined. The fossae are shown on the other side. The insert illustrates the fossae viewed from within, and the evolutionary development or internal exit of the hernia. By glancing at this illustration, one should be able to harmonize and reconcile any possible confusion which may exist in the concept of hernia from within or from its external manifestation.

CONCLUSIONS

1. The inguinopelvic fossae and their boundaries have been described and illustrated, separately and compositely.

2. Hernias of the inguinal fossae have been classified from their posterior, internal, or foveal relationship.

3. Special attention has been directed to the relationship of the hernial sac to the bladder in the supravesical triangle.

4. A hernia may originate as an internal one and become external, or a hernia in the middle fossa, and more rarely of the external inguinal fossa, may descend and assume a paravesical relationship. The term internoexternal hernia as used herein does not apply to the relationship of the sac to the inferior epigastric vessels, but to whether the hernia will become manifest externally.

5. Semilunar line, semicircular line, and interfascicular hernias, sometimes referred to collectively as ventral inguinal hernias, have been correlated with hernias occurring in the external inguinal fossa.

6. Because of their close relationship anatomically, diagnostically, and therapeutically, hernias of the lateral pelvic fossae, and obturator and sciatic hernias have been included with inguinal hernias.

7. The need for emphasizing the importance of practical knowledge of the anatomy of the inguinopelvic region has been stressed as essential to the attainment of well integrated repair of single, combined, or multiple herniations.

8. The superiority of the deeper, three dimensional, structural repair, when the criteria for it are present, has been stressed.

9. There are twenty vulnerable areas in the inguinopelvic region through which herniation may occur: six in the supravesical fossa (internal inguinal), seven in the middle inguinal fossa, five in the lateral or external inguinal fossa, and two in the lateral pelvic fossae.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Temporomandibular Arthrosis. JENS FOGED. *Lancet*, Lond., 1949, 2: 1209.

It is the author's belief that cracking of the temporomandibular joint and its accompanying features is due to arthrosis—a degenerative noninfectious condition.

The lesion is seen most often in persons from 20 to 30 years of age, and is more common in women. The disease is usually a chronic and protracted one. The etiological factors are direct injury to the joint, or indirect injuries such as protracted or forced yawning, displacement of the bite, dysfunction and hyperfunction, or disorders of articulation.

As a rule, the patient first notices an oft-repeated, but otherwise asymptomatic, cracking in the joint; sooner or later this is followed by pain which gradually becomes worse, and is accompanied by reduction of mobility. On physical examination a cracking in the joint is often heard. Inspection seldom reveals any abnormality. On palpation there is usually tenderness on deep pressure, and grating or cracking can be felt. Reduction of mobility of yawning, with lateral deviation or protrusion of the jaw, is present in the majority of patients.

A characteristic sign in the patient with unilateral arthrosis is deviation of the chin to the affected side when the mouth is opened wide. X-ray examination may aid in the diagnosis.

The following pathologic changes were found at operation: (1) the meniscus showed evidence of altered mobility, (2) the lower joint cavity was more or less obliterated, and (3) articular cartilage showed signs of degeneration.

Primary treatment should be conservative and should be aimed at restoring the bite to normal. If dental examination reveals no cause for the disability, if there is progressive limitation of movement, or if the condition is very severe or very protracted, surgery should be carried out. The operation is performed under local anesthesia, and consists of extirpation of the meniscus with severance of adhesions. After-care consists of a fluid diet for several days, followed by active training of the movements of the lower jaw. Facial paralysis may be a complication, but is only partial and transient.

ELY ELLIOTT LAZARUS, M.D.

Sebaceous Glands and Sebaceous Gland-Containing Tumors of the Parotid Salivary Gland. ARNOLD J. RAWSON and ROBERT C. HORN, JR. *Surgery*, 1950, 27: 93.

A case is reported in which sebaceous glands were found to arise from the ducts of the parotid salivary gland. Four similar cases have been reported in the literature.

In the past 1½ years the authors have discovered 2 tumors of the parotid salivary gland which differed strikingly from 160 other salivary gland tumors studied at the Hospital of the University of Pennsylvania, in Philadelphia. One of these closely resembled the papillary cystadenoma lymphomatosum, with the addition of well formed sebaceous glands. The other tumor, which did not resemble the papillary cystadenoma lymphomatosum as strikingly, and which simulated somewhat the mucoepidermoid tumor, contained cells identical with those characterizing normal sebaceous glands. Both of these cases are reported. No previous reports of tumors of this description have appeared in the literature.

Since the parotid gland is of ectodermal origin, the fact that its ducts may occasionally develop accessory structures similar to those of the epiderm may be reasonably accounted for. Sebaceous glands have been found to occur on the area of buccal mucosa corresponding with the site of origin of the parotid gland in embryonic life.

From the histologic features of the papillary cystadenoma lymphomatosum in the 2 cases studied by these authors, they believe that the tumor arises from salivary ducts. They postulate that the sebaceous gland elements included in the tumors arose from the ductlike structures of the papillary cystadenoma lymphomatosum just as they arose from the normal salivary ducts in the first case reported. The idea of salivary duct origin is also compatible with the opinion that the papillary cystadenoma lymphomatosum arises from oncocytes —large cells with abundant eosinophilic granular cytoplasm, not infrequently found in the salivary ducts and acini of older individuals. Because of the histologic characteristics, the authors do not believe that lymphoid tissue is the site of origin of these tumors. Other theories of origin of the papillary cystadenoma lymphomatosum are based upon derivation from cell rests and from lymph vessel endothelium. It is pointed out that a wide variety of types of epithelial cells characterize the ducts of the salivary glands, and that the great variety of tumor types assigned to these ducts should occasion no surprise.

JACOB T. BRADSHER, JR., M.D.

Reconstructive Surgery Following Radical Operation for Malignant Tumors of Head and Neck. HERBERT CONWAY. *Ann. Surg.*, 1950, 131:64.

A patient who has undergone a radical excision of a neoplasm of the head or neck is left in an unfinished state if the treatment does not also include reconstructive surgery. A plea is made for the exercise of

methods and principles of reparative surgery at the time of the primary excision.

The principles involved in radical excision of malignant tumors of the face are as follows:

1. Generous estimate of the amount of tissue to be removed with the tumor.
2. Placement of incisions parallel to the lines of elasticity of the skin when possible.
3. Unhesitant sacrifice of important anatomic structures in the neighborhood of the tumor.
4. Resection of regional lymph nodes, if involved.

With a view to final reconstruction, the surgeon should:

1. Close all wounds by the suture of mucous membrane to skin or by the use of temporary thick-split grafts of skin.
2. Pay attention to the fixation of jaw fragments by intermaxillary wiring (by external splint or by intramedullary splint) so that unnecessary contracture of muscles does not occur.
3. Utilize primary flaps of regional tissue, or outline flaps for reconstruction at the time of the radical excision.

In the final reconstruction, the plastic surgeon may utilize:

1. Free grafts of skin, derma, fascia, cartilage, or bone.
2. Pedicled flaps from neighboring tissues or from a distant site.
3. Plates of foreign material, such as vitallium, tantalum, or polyethylene.

Recent additions to these methods include the use of diced cartilage for filling out a concavity and the use of composite free grafts of skin and cartilage from the ear. Attention to color match of the transplanted skin surface is important to the rehabilitation of the patient. This can be accomplished successfully by the intradermal injection of insoluble, flesh-colored pigments (tattooing).

Eleven cases are described and photographs are presented to illustrate the above.

JOHN J. BALLENGER, M.D.

EYE

Foreign Bodies of the Eye. ALSTON CALLAHAN. *J. Am. M. Ass.*, 1950, 142: 249.

A series of 192 cases of foreign bodies in the eye is presented. Seventy-seven per cent of the foreign bodies were located in the cornea. Examination of the patient is outlined, and the treatment is discussed. The author states that examination should be made with a strong light, and a magnifying loupe or slit lamp.

The following procedure is suggested: (1) examination for vision; (2) examination for point of entry with fluorescein; (3) detailed study of anterior segment of eye—(a) hole in iris? (b) tract in lens? (c) if hemorrhage is present an attempt should be made to determine its extent, source and location; (4) detailed study of posterior segment; (5) roentgenogram of orbit.

The recommended treatment of foreign bodies in the cornea is removal with the use of a spud, under magnification, especially the slit lamp.

In cases of foreign bodies located intraocularly, both eyes are patched, the patient is hospitalized, tetanus antitoxin is administered, the patient is carefully examined, and a diagnosis is made. Surgery is not an emergency and accurate localization should precede any surgical attack. The author believes that the method of Sweet and Comberg is best for accurate localization. Other methods which may be helpful are (1) Vogt bone-free films; (2) air or oxygen injection in Tenon's capsule; (3) exposure of the sclera, suturing lead bead to sclera, and relocalizing; (4) use of the Walker diathermy pin.

Foreign bodies may be removed by either the anterior or posterior route. The procedure, anteriorly, is to pull the foreign body around the lens, through the pupil into the anterior chamber, and then remove. This method of surgery is easier and the risk is less. Removal by the posterior route may be through the pars plana, or directly over the foreign body. For nonmagnetic foreign bodies causing ocular disturbances, removal with forceps or the endoscope may be attempted.

An excellent summary is given of six articles dealing with ocular injuries. EARL H. MERZ, M.D.

Ocular Contusions in National Emergencies. BRITTAIN F. PAYNE. *J. Am. M. Ass.*, 1950, 142: 243.

In the event of a national emergency, contusions of the eye will be one of the major causes of ocular disability. Observation should be continued for some time, as complications develop weeks later.

Some of the important ocular changes seen in contusions are: (1) edema and hemorrhage; (2) alteration in various structures of the eye ball, as cornea, sclera, etc. (a detailedan atomical discussion was introduced here); (3) iridodialysis; (4) rupture of iris sphincter; (5) rupture of suspensory ligament plus dislocation of the lens; (6) cataract formation; (7) hemorrhage in vitreous; (8) choroidal rupture; and (9) separation of retina.

The management of contusions calls for little action and considerable patience; many will heal following simple cleansing, bandaging, and rest. It is often unwise to use atropine as glaucoma may result.

The examination includes close observation for irregularities of the corneal surface, erosions of the cornea, hyphema, pupil changes, depth of chamber, tremulous iris, cataract formation, vitreous hemorrhage or retinal damage, and for foreign bodies.

Active treatment can be instituted after a complete diagnosis has been made.

EARL H. MERZ, M.D.

Chemical Burns of the Eye. W. MORTON GRANT. *J. Am. M. Ass.*, 1950, 142: 152.

Ocular injuries from different chemicals vary widely in their rate of onset, symptomatology, depth of involvement of the cornea and conjunctiva, and particularly in their prognosis. Factors which are

especially well recognized as being influential in determining the nature of various chemical injuries are the amount and duration of exposure, the reactivity of the noxious substance with tissue components, and the physical characteristics which may determine the penetration of the noxious substance through cell membranes or its injuriousness to these membranes.

The exposure is greatly influenced by the concentration and physical state of the material, and by such warning properties as stinging and lacrimation. Many compounds may react with, or become attached to, specific groups in proteins and alter the biologic properties of corneal structures or corneal enzymes. The depth and severity of the injury may be significantly influenced by the solubility of the compounds which determines their facility of penetration into the cornea.

The initial treatment recommended is thorough irrigation of the eyes and mechanical removal of any foreign particles, with no waste of time in attempting to apply specific neutralizing agents with the exception of 2, 3-dimercaptopropanol (BAL) in arsenical burns. Following thorough decontamination, treatment consists of the application of lubricant ointment, an antibiotic, atropine, and a dressing. Surgical or radiational treatment of corneal opacities may be undertaken later when corneal changes have stabilized. FRANK W. NEWELL, M.D.

Aureomycin in Ophthalmology (A Preliminary Report). SIR STEWART DUKE-ELDER, D. AINSLIE, and A. J. BOASE. *Brit. J. Ophth.*, 1950, 34: 30.

Aureomycin was used locally and systemically in 33 ocular infections commonly found in Great Britain, and in 8 cases of trachoma in Uganda where the disease is extremely virulent. The results of this treatment in Great Britain were not particularly dramatic. Aureomycin appeared useful only in preventing secondary infection in 9 cases of dendritic keratitis. No definite improvement was noted in 12 cases of bilateral uveitis, with the possible exception of 1 case of hypopyon uveitis. No beneficial effect was noted in 5 cases of superficial punctate keratitis, 1 case of herpes ophthalmicus, 1 case of sympathetic ophthalmia, and 1 case of disciform keratitis. There was some initial improvement in the single case of blepharoconjunctivitis. Improvement was observed in 1 case of Hemophilus influenzae conjunctivitis, but relapse occurred 3 days after treatment was discontinued. There was marked improvement in 1 case of inclusion conjunctivitis, and 1 case of disciform keratitis seemed benefited.

Eight patients with trachoma were treated in Uganda with the conjunctival instillation of one drop of aureomycin at 4 hour intervals. Results were extraordinarily impressive: symptoms disappeared, pannus was absent except for a narrow fringe of vessels at the limbus, and the papillae regressed. The author warrants the opinion that aureomycin will cure trachoma in an incredibly short time.

FRANK W. NEWELL, M.D.

Orbital Tumors. J. BRUCE HAMILTON. *Austral. N. Zealand J. Surg.*, 1949, 19: 101.

The orbit is the ideal site for surgical teamwork, but this has never been achieved so far.

Also, the orbit is so filled with vital structures that a great many surgeons have avoided it with grim determination. If the case is one of injury, then the retention, or otherwise, of an orbital or intraocular foreign body, or a fracture of the orbital walls can, more often than not, be confirmed roentgenologically. The removal of a retained intraorbital foreign body is usually not such a difficult task, but small nonmagnetic foreign bodies in the apex of the orbit, treated by present chemotherapeutic agents, are often best left *in situ*. For fracture of the orbit involving the face, the dental surgeon and the plastic surgeon, in co-operation with the ophthalmic surgeon, are needed. Operations for the relief of fractures of the superior orbital fissure or of the optic foramen do not appear to be warranted procedures. Loss of sight in one eye following fracture of the optic foramen is seldom restored by decompression of the optic foramen, and it is believed that the crush fracture has produced nerve damage which decompression is unable to rectify. One cannot expect regeneration of an injured second cranial nerve.

The diagnosis of unilateral thyrotoxic exophthalmos can be a real problem, especially in cases in which the optic nerve becomes acutely swollen and shows hemorrhages. These may be treated by decompression of the orbital roof and the optic foramen.

Having satisfied oneself that the lesion being dealt with is a tumor, it is then important to define whether this tumor is primary or secondary.

Another point which must be defined is whether there is any tumor extension between the orbit and the cranial cavity.

Occasionally paranasal or lacrimal carcinoma invades the orbit, especially through the thin medial orbital wall.

The diagnosis of operable tumor having been made, the chief interest now is how it should be approached. Firstly, the anterior route which is very suitable for dermoids and angiomas in the anterior third of the orbit, and also for lacrimal gland and sac tumors; secondly, Kronlein's operation, which should be limited to those tumors situated in the lateral orbital content; thirdly, there is the transfrontal approach, which is ideal for all tumors within the orbital muscle cone and especially for those tumors producing changes in the optic nerve and retina; and finally, the intranasal approach, which is best suited to those tumors which are limited to the medial third of the orbit and are obviously an extension from the paranasal sinuses.

MICHEL LOUTFALLAH, M.D.

Intraorbital Meningiomas. A Clinicopathologic Study. WINCHELL MCK. CRAIG and LOUIS J. GOGELA. *Am. J. Ophth.*, 1949, 32: 1663.

Until recently, intraorbital meningiomas have been almost exclusively a problem of the ophthal-

mologist. With the demonstration of an intracranial route of approach for their removal, intraorbital meningiomas now have come to be fully as important to the neurosurgeon as are meningiomas elsewhere.

Primary intraorbital meningiomas are comparatively rare; they have been recognized and removed surgically in 17 cases at the Mayo Clinic. Secondary, or invading, intraorbital meningiomas occur more frequently.

Seventeen cases of primary intraorbital meningioma and 35 cases of secondary intraorbital meningioma in this series were studied. The primary intraorbital meningiomas were subdivided into three groups: (1) foraminal, (2) sheath, and (3) extradural.

The foraminal and the sheath meningiomas probably arose from clusters of arachnoid cells within the sheath of the optic nerve. No similar source was found to account for the extradural growths. It is suggested that they may develop from enlarging cell clusters protruding through the sheath of the optic nerve.

Intraorbital meningiomas are four times more common in women than in men, and tend to occur during the middle years of life, as do meningiomas located elsewhere.

The order in which proptosis and visual impairment appear does not serve as a reliable aid in distinguishing intraorbital meningiomas from other intraorbital lesions. Roentgenologic changes about the orbit are usually suggestive of an invading or secondary type of intraorbital meningioma.

The transcranial route of approach best meets any contingencies which may arise in the attack on these tumors.

An Operation for Ptosis Utilizing the Superior Rectus Muscle. R. N. BERKE. *Arch. Ophth.*, Chic., 1949, 42: 685.

In utilizing the superior rectus for the correction of ptosis, the author shortens the muscle 5 to 10 mm. to avoid postoperative hypotropia. Twenty cases in which uniform success was obtained with this procedure are reported.

A horizontal incision is made at the level at which a lid fold should be, through skin and orbicularis, for 25 mm. The upper and lower parts of this flap are reflected from the tarsus. At the upper edge of the tarsus an incision 10 mm. wide is made through the conjunctiva.

A blepharostat is now inserted. The globe is pulled down by a silk suture through the limbus at 12 o'clock, and an incision is made through the conjunctiva over the insertion of the superior rectus. The superior rectus is exposed for 10 mm., and three double-armed plain gut sutures are passed through the medial, middle, and lateral thirds of its tendon about 2 mm. from the insertion. The tendon is then severed from the globe, and the muscle is shortened 5 to 10 mm., depending on its strength, by passing two double-armed chromic gut sutures successively through the lower lip of the conjunctiva, the stump attached to the sclera, the superior rectus at the proper height, and the upper lip of the conjunctiva. When tied, there is exposed a tongue of muscle, which is split into three smaller tongues each having the preplaced double-arm gut suture. These are pulled through the opening in the conjunctiva and spread over the anterior surface of the tarsus. The needles are then passed through the gray line of the upper lid so that each pair of sutures is 5 mm. apart. After the sutures are tied there should be an overcorrection of 2 mm. to counteract the postoperative reaction. Silk or plain gut sutures are then looped through the lower skin flap, under the transplanted tongues of the superior rectus, and through the upper skin flap. When tied, a lid fold is produced, and the lashes are prevented from turning in. Finally the lower lid is pulled up over the cornea by a Frost silk suture. A dressing with moderate pressure is applied. The dressing and Frost suture are removed on the fifth day. For a few weeks thereafter 1 per cent methylcellulose is instilled four times a day, to protect the cornea. JAMES E. LEBENSOHN, M.D.

Adenocarcinoma (Mixed Tumor) of the Lacrimal Gland. NORMAN FLEMING. *Brit. J. Ophth.*, 1949, 33: 763.

To date, less than 300 mixed tumors of the lacrimal gland have been reported. Such tumors may show local malignancy and bring about the death of the patient.

The author's patient was a girl, aged 19 years, who had noted a proptosis of the left eye for 2 years, which had materially increased in the last 4 months. Vision in the right eye was 20/15; in the left eye, 20/30. A provisional diagnosis of meningioma of the optic nerve was made, and the orbit was explored from above after a left frontal craniotomy. A tumor of the lacrimal gland was revealed, which extended backward to the apex of the orbital cavity. This was removed intact with surrounding tissue. Postoperative x-ray treatments were given, the tissue dose calculated at the lacrimal gland being 4,783 roentgens in 4 weeks.

The pathologist reported the microscopic picture as being that of an adenoma with patches of mucoid degeneration. The lacrimal gland could not be identified. He stated: "From the strictly histological standpoint, and judging by the usual criteria, this tumor would appear to be benign but it is clear, from Godtfredsen's paper, that growth behavior in this group is not consistent with microscopic structure, and that these tumors must be regarded as essentially malignant."

For a year after operation the patient was in excellent health. There was a moderate ptosis, but no dryness of the eye, and the corrected vision thereof was 20/30, as it had been before operation. However. a year later she became thin, weak, and bedridden, The left eye again became exophthalmic and the lower two-thirds of the cornea became keratinized. The recurrence projected forward above the eye and evidently filled the orbit.

JAMES E. LEBENSOHN, M.D.

Corneal Transplantation: Visual and Cosmetic Results. FREDERICK C. STANSBURY. *Arch. Ophth.*, Chic., 1949, 42: 813.

The recent wave of optimistic literature on corneal transplantation is unwarranted by the over-all perspective. The author reviews 165 operations performed on 110 patients at the Presbyterian Hospital, New York City, in the past 15 years. All cases were followed for at least 6 months after operation, the average being 37.7 months. The number of clear transplants was double that showing visual improvement. Transparent grafts that bulge enough to prevent useful vision are thus frequent. A result should be considered successful only if there is improvement in acuity to better than 20/200.

In the present series preoperative vision was better than 20/200 in 14 eyes; between 20/200 and hand movements in 138; and limited to light perception in 13. Postoperative acuity was improved in 16 per cent; no significant change was effected in 42 per cent; and a diminution of vision occurred in 39 per cent, one third of this last group losing light perception.

None of the eyes with chemical burns was improved. A successful result occurred in only 2 of 35 eyes with secondary transplantation. From the author's data, successful corneal transplants may be expected (1) in about 30 per cent of eyes with keratoconus, 10 of the 22 successful cases being in this group; (2) in about 15 per cent of eyes with interstitial keratitis, corneal dystrophy, or traumatic scars; (3) in about 10 per cent of eyes with postinflammatory scars; and (4) in about 5 per cent of eyes that have already had a previous corneal transplantation.

In the successful cases, the final corrected acuity was 20/30 in 4 patients, 20/40 in 1; 20/50 in 8; and 20/100 in 4. The refraction shows a definite trend toward high myopia, probably because of the tendency of the graft to bulge. Twenty patients had bilateral corneal grafts. In half of these the acuity was improved to better than 20/200. Three of these 10 patients obtained successful results in both eyes.

JAMES E. LEBENSOHN, M.D.

Hemangioblastoma of the Retina (von Hippel-Lindau Disease). ANDREW RADOS. *Arch. Ophth.*, Chic., 1950, 43: 43.

Angiomatosis of the retina is part of a syndrome characterized by the occurrence of single or multiple hemangioblastoma in the cerebellum, the brain stem, and spinal cord, with vascular cysts of various viscera. Males are affected more frequently and the condition occurs most frequently in the third decade but has been recorded in a premature infant. The condition has a hereditary tendency and may show horizontal, vertical, horizontal-vertical, and collateral involvement.

The usual ophthalmoscopic appearance in the early stage is that of a greatly dilated artery, often beaded and winding, with great tortuosities in its proximal portion and terminating distally in a somewhat round, globular, reddish nodule, the angiomatous tumor. From the nodule the accompanying vein, presenting a similar appearance, returns to the disc. Often there is an anastomosis between the vessels leading to hypertrophy of the veins and capillaries. The vascular changes are followed by edematous and exudative degenerative changes. Cloudiness appears in the neighborhood of the nodule, the retina becoming grayish yellow or gray-green. Small subretinal specks appear; through confluence, band-shaped or large subretinal sheets appear. In most cases the condition is progressive.

The tumors are composed of networks of vessels of very small caliber, typically convoluted and usually consisting of a single-layered endothelial channel. The vascular loops may be closely or loosely arranged with glial tissue and connective tissue elements filling the interstices. The tumors are sharply demarcated from normal tissue, there are no mitotic figures, and there is a similarity in structure in spite of a polymorphism of the nuclei. Formation of cystic spaces or large cysts is a constant feature, as is the occurrence of pseudoxanthoma cells. The simultaneous occurrence of hemangioblastoma in the retina and central nervous system seems to be assured, even if not definitely proved in some cases. Involvement of abdominal organs is usually not diagnosed except at autopsy.

The condition should be sharply distinguished from Coat's exudative retinitis which begins as an inflammation with massive exudation, is never associated with tumor formation of vascular elements, and is almost always unilateral without hereditary, familial, or systemic involvement. Angioma of the retina may be differentiated from retinal angiomatosis by its location near the disc rather than the periphery, its raspberrylike surface, unilateral occurrence, absence of degenerative or exudative changes, and absence of hereditary or systemic involvement.

Two cases are reported, 1 in a girl of 16 years, and the other in a male of 28 years. In each, the left eye was removed because of painful secondary glaucoma. In both cases the tumors were intraretinal and of the capillary angioma type with endothelial proliferation and sproutings with cystic cavities. In the first case the subretinal transudate was extremely rich in cholesterol crystals; the number of these crystals was negligible in the second case, but the transudate exhibited large numbers of swollen, desquamated, and proliferating pigment derivatives.

FRANK W. NEWELL, M.D.

Detachment of the Retina in Early Sarcoma (Malignant Melanoma) of the Choroid. BERNARD SAMUELS. *Arch. Ophth.*, Chic., 1949, 42: 620.

Microscopic preparations of early sarcoma of the choroid may show, in addition to the ophthalmoscopically visible detachment of the retina confined to the neighborhood of the tumor, a circumscribed slitlike minimal retinal detachment on the opposite side of the fundus. Nineteen collected cases

from the Eno Laboratory of the New York Eye and Ear Infirmary are reported. In 12 cases the minimal detachment occurred at a distance from the primary tumor. The height of the separation ranged from 0.125 to 0.2 mm.; only once did it attain 0.5 to 1.0 mm. In 5 cases the area detached varied from the entire side of the fundus opposite the tumor to an extremely limited involvement. In a number of cases there were several minute detachments. In 10 cases there was a circumscribed vesicular detachment immediately behind the ora serrata, or 1 or 2 mm. from it. The extent of the detachment ranged from 1 to 6 mm.

The damage to the rods and cones of the involved areas was greater than would probably have occurred, in the same period of time, in a case of spontaneous or traumatic detachment. The fluid in the subretinal space of the detachment area took exactly the same stain as the fluid adjacent to the tumor, which lent weight to the impression that it was one continuous sheet. From the anatomic standpoint, minimal retinal detachments and detachments at the ora serrata must represent steps in the progress of a sarcomatous separation of the retina, the end of which is total detachment.

The clinical recognition of minimal detachment is difficult, particularly since there are no folds in the retina. However, the transparency of the retina may be so impaired as to cause markings of the choroid to be indistinct. A reduction of the field for blue, corresponding to an area distant from the tumor, should arouse suspicion of a minimal detachment. Search with the indirect method of ophthalmoscopy may lead to the discovery of detachment at the ora serrata. FRANK W. NEWELL, M.D.

NOSE AND SINUSES

Dacryocystorhinostomy Report of 150 Cases of Dacryocystitis Occurring from 1938 to 1947. BERNARD WELT. *Arch. Otolar.*, Chic., 1950, 51: 83.

The author gives a brief historical review of dacryocystorhinostomy, beginning with the Greek culture and carrying it up to the present. The object of the operation is to create a permanently patent fistula between the lacrimal sac and the nasal mucosa, and the success of the operation depends largely on the ability to prevent closure of the bony window through which the anastomosis occurs. The author believes the latter is accomplished by making a large bony window "so . . . that osteogenesis exhausts itself before the window can close." In addition, he believes that sewing the muscosal flaps over the window edges helps in slowing the rate at which this happens. The importance of removing each obstructing ethmoid cell with its mucosal lining is stressed. Occasionally the author has found it necessary to remove the anterior end of the middle turbinate. The author's technique is described in some detail. He believes the incidence of failure in 147 operations performed with his method has been 4.7 per cent. JOHN J. BALLINGER, M.D.

The Role of Sinusotomy and Needle Puncture Irrigation in the Surgical Treatment of Frontal Sinus Infections. W. H. B. MAGAURAN. *Med. Press & Circ.*, Lond., 1949, 222: 3.

The author attempts to re-establish the physiological mechanism of frontal sinus drainage. The mechanism of this drainage is ciliary propulsion of the mucus. The speed gradient of this movement increases as the ostium is approached. There is a drag action over areas of inactive cilia. Ciliated epithelium rapidly regenerates after removal, and it has been shown that ablation of the active ciliated ostial region by surgical enlargement of the frontal sinus outlet under aseptic conditions is followed by stagnation of the secretion with sepsis within the sinus. The multiplicity of bacteria, which can be an etiological factor in frontal sinusitis, is reviewed, and it is pointed out that all of the bacteria are not penicillin sensitive, e.g., the Bacillus pyocyaneus. Thickening of the mucous membrane in chronic sinusitis is due to a dilatation of the lymph spaces, the extravascular corpuscular elements, and the connective tissue cells and fibrils. These changes are reversible and ablation of the infection results in a resolution of the mucosal thickening. It is with these basic physiological principles in mind that sinusotomy and needle puncture irrigation is proposed. It is recommended under the following conditions:

1. Acute sinusitis which is unresolved or which has been neglected, with resulting incipient or developed complications. (Acute frontal sinusitis due to swimming is so liable to complications that it is listed).

2. Chronic sinusitis with complications, with an unresolved acute exacerbation, or which has failed to respond to proper intranasal treatment, namely, removal of ethmoidal polyps and infected ethmoidal cells, correction of septal deflection and impingement of enlarged turbinates, but in which all other related sinus infections have been cleared up.

Technique of the operation. Chemotherapy of some sort is indicated before surgery is begun. A 2 cm. incision is made over the middle of the inner third of the supraorbital border. This should end short of the anterior border of the supratrochlear fossa. By careful dissection the supraorbital nerves and arteries are avoided. An oval opening of about 1 cm. from before backwards and about 12 mm. from side to side is made. Drainage and irrigation are carried out through this opening. If there are large polyps present in the chronically infected sinus they are removed along with the extremely thickened membranes, but the ostial region is carefully avoided. Cultures are taken and appropriate antibiotics instituted. After healing of the wound, needle puncture irrigation can be done very nicely through the scar of the operated area either as a diagnostic or therapeutic procedure. This is considerably better than canalization of the frontal sinus ostium with the frontal sinus cannula which may traumatize the mucous membrane.

The author cites a series of 2 cases of acute frontal sinusitis, 1 of which was of the bilateral intercom-

municative variety, and 4 cases of chronic unilateral frontal sinusitis, 2 of which were complicated by intrasinus polyps. All of these cases cleared up very satisfactorily with the described therapy.

WILLIAM K. WRIGHT, M.D.

Mucocele of the Frontal and Ethmoid Sinuses. Evaluation of the Use of Acrylics and Tantalum in the Surgical Treatment. SAMUEL KAPLAN, ARIAH SCHWARTZ, and BATES F. METSON. *Arch. Otolar.*, Chic., 1950, 51: 172.

Mucocele of the frontal or ethmoid sinuses results from blockage of natural ostia. Among these causes of obstruction are previous operations on the frontal sinus, osteoma, chronic sinusitis, fractures of the paranasal sinuses, obstructing polyps, and a deviated nasal septum encroaching on the middle meatus.

In the past, surgery for correction of the mucocele has met with a high incidence of failure in maintaining the patency of the reconstructed nasofrontal duct. The causes of failure are: (1) obstruction of the frontonasal passage by fibrotic or bony closure, (2) remnants of the frontal sinus floor which give rise to undrained infected pockets in the frontal sinus, and (3) incomplete ethmoidectomy.

The use of an acrylic tube or tantalum foil placed in the sinus cavity so as to extend into the nose has considerably reduced such complications. The acrylic tube is from 4 to 5 cm. in length and 4 mm. wide and need not have a lumen. If the operative cavity extends far laterally, a malleable tantalum foil apron measuring 5 by 3 cm. is sewed into the cavity. The tantalum foil should not be placed so far anteriorly as to overlie the pulley of the superior oblique muscle as diplopia may result. These materials cause little tissue reaction and can be left in place for an indefinite period, possibly permanently. Four case histories are presented. JOHN R. LINDSAY, M.D.

MOUTH

Modern Trends in Harelip and Cleft Palate Surgery. A Review of 500 Cases. MICHAEL C. OLDFIELD. *Brit. J. Surg.*, 1949, 37: 178.

Harelips and cleft palates are a great source of insecurity and maladjustment in children. About 1 in 600 babies has one of these defects. The only significant etiologic factor is inheritance and the only conditions under which a high percentage of these defects can be prognosticated is when both parents are similarly afflicted. These deformities are probably due to a recessive mendelian characteristic. Malnutrition and virus infections in the pregnant mother during the first 3 months of pregnancy probably are not important. The male-female ratio is 3 to 2.

Harelips may be divided into the unilateral and bilateral, and the complete or incomplete. They should be repaired as soon as the baby is stabilized and thriving, that is, when it is about 10 pounds in weight. The baby and mother should be isolated and the baby should be breast-fed if possible. Endotracheal ether is the anesthesia of choice. In repairing a harelip it is very important to correct any associated nostril deformity, which usually consists of widening and depression at the base, depression of the dome, loss of external alar rim convexity, and deviation of the columella. These deformities are apparently due to the underlying defect in the bone. The soft tissues must be well elevated. Unilateral cleft lips are repaired after the simplified technique of Brown and McDowell. In repairing a bilateral cleft lip there is frequently an exaggerated anterior tilting of the premaxilla which must be corrected at a preliminary operation together with closure of one of the clefts. When this is not present and there is an incomplete cleft on one side, this cleft is closed by direct excision with the previously mentioned flap repair on the other side. Shortening of the columella is the usual consequence of primary repair of complete bilateral cleft lip and is repaired by the VY lengthening procedure of Brown and McDowell. Cleft palates may be classified into: (1) involvement of the soft palate, (2) additional involvement of the hard palate, (3) additional unilateral cleft of the alveolus, and (4) additional bilateral cleft of the alveolus. The last two types are usually associated with harelip. There is usually plenty of soft tissue element except in the second type. In this type there is also frequently an associated mandibular regression. Cleft palates should be repaired as late as possible before the development of speech, at about 18 months.

The author mentions two types of submucous clefts in which the bone and muscles are cleft more extensively than the mucosa or skin. Veau described these in connection with the lip and palate, and Mengele described them in connection with the soft palate where they caused a speech defect because of immobility of the soft palate even though there was no anatomical cleft. These cases were corrected by excision of the nonmuscular mucous membrane and approximation of the muscular tissues to each other. The author goes into some detail in describing the mechanism of closure of the nasopharyngeal isthmus by the soft palate, in which he differs somewhat from the usual anatomists. The nasopharynx is normally closed by the middle third of the soft palate which is raised by the levator palati muscle and brought in contact with Passavant's ridge or the palatopharyngeus muscle which contracts tonically during speech or deglutition. This ridge is located on the posterior wall of the pharynx. The tensor palati muscles normally act as antagonists to the levator sling to depress the palate. In patients with cleft palate these muscles can be transformed as valuable additions to the levator sling by destroying the fulcrum at the hamulus process. The author says that it is much more important to get a rapidly arching strong muscular palate than a long and flaccid one. The operation is done according to the principles laid down by Veau. The edges of the cleft of the hard and soft palates are freshened. Lateral relaxation incisions are made at the margins of the

alveolus. The hamulus process is fractured inwardly and the lateral wall of the nasopharynx is separated from the inner side of the pterygoid plate by blunt dissection. The anterior opening incisions are made and the communicating branch between the anteroposterior palatine arteries is divided. A short anterior flap is elevated from the hard palate and the posterior palatine flap is elevated to preserve the posterior palatine artery. The lateral nasal flaps are elevated beginning in the posterior aspect of the hard palate. The septal mucosal flaps are mobilized by blunt dissection. Beginning at the anterior edge of the cleft palate, the medial septal and nasal flaps are united with No. 000 catgut with care to invert the edges. The edges of the soft palate are sutured with the knots appearing on the upper surface of the soft palate. The muscles of the soft palate are then closed by separately buried interrupted sutures or the muscle layer is approximated with the mucosa by an "end on" type of mattress suture. The buccal mucosa sutures are alternated with "end on" mattress sutures alternating with single sutures. The soft palate is lengthened in the midline by the Wardill method of an inverted "V" incision inverted into a "Y" incision in the anterior triangular flap. Secondary surgery for cleft palate is performed in the same manner, if possible. If there is insufficient tissue the Gillies-Fry or a Wardill pharyngoplasty is required. Of these, the latter is the less desirable. Speech training, orthodontic treatment, and ear, nose, and throat treatment are always used in the follow-up. Adenoidectomy and tonsillectomy are discouraged unless absolutely necessary because of the danger of making an inadequate nasopharyngeal valve.

The author presents a series of 113 primary closures of cleft palate and 70 secondary closures. The percentage of excellent and good results is considerably better in primary closures, and in only 5.3 per cent was there an incompetent nasopharyngeal valve. WILLIAM K. WRIGHT, M.D.

Cancer of the Face: Treatment and Plastic Repair. GORDON B. NEW. *Plastic & Reconstr. Surg.*, 1949, 4: 528.

Patients with cancer of the face do not receive as efficient treatment as one would expect, considering the site of the lesions and the facility with which a diagnosis can be made. Although biopsy should be performed before treatment is instituted in cases in which the diagnosis is questionable, it is much better to remove the entire growth, if possible, and to examine a fresh frozen section to corroborate the clinical diagnosis. The author does not think that a specimen for biopsy should be removed by a physician who is not prepared to treat the tumor in a radical way if it proves to be cancerous. The chance for permanent cure will be much better if the surgeon who is to perform the operation can examine the patient before a specimen for biopsy is removed so that he is able to determine the apparent extent of the tumor, and select the site from which the specimen should be removed. At times, the trauma resulting from the removal of the specimen makes it impossible to determine how much of the enlargement is the result of the tumor and how much is the result of reaction from the trauma caused by removal of the specimen. This makes it difficult for the surgeon to decide how widely to remove the tumor beyond the apparent margin. Sometimes, in removing the specimen for biopsy, the incision is placed so that it interferes with a pedicle flap or a rotation flap that might be employed in a reparative procedure. In other words, if a plastic operation ultimately will be required, the plastic surgeon should be consulted regarding the tumor before its removal, or, better still, he should be allowed to remove the lesion.

In the surgical management of malignant tumors of the face, either sharp dissection or electrocoagulation (surgical diathermy) may be employed. When using these two methods of treatment, cancer of the face may be divided into four groups: (1) lesions which permit of sharp excision and which, after excision, leave wounds that can be closed immediately by simple approximation of their edges; (2) lesions which permit of sharp excision and which, after excision, leave wounds that require the use of a skin graft for repair; (3) lesions which should be removed by surgical diathermy and which, after electrocoagulation, leave small wounds that heal spontaneously by granulation and epithelization, and (4) lesions which should be removed by surgical diathermy and which, after electrocoagulation, leave extensive facial defects that require some form of plastic repair.

The first group includes small basal cell epitheliomas and low grade squamous cell epitheliomas of the face which have not been treated previously and which are so situated that primary closure of the wound is possible after wide removal of the growth.

The second group of tumors includes basal cell and squamous cell epitheliomas which are large, which have not been treated previously, and which are superficial and freely movable.

The third group of tumors includes small malignant lesions which are of a high grade of malignancy or which recur after previous treatment, particularly irradiation therapy.

The fourth group of tumors includes very extensive malignant lesions of the face which have been treated previously.

Complete primary removal of carcinoma of the face is essential. Examination of fresh frozen sections of tissue at the time of the operation aids in determining the best treatment. In cases in which the tumor recurs and becomes fixed after irradiation, examination of fresh frozen sections is an aid in determining the limits of the growth. Bilateral dissection of the submental and submaxillary glands should be done in cases of squamous cell epithelioma, Grade 2, 3, or 4, of the lower lip or cheek. The time of repair of the postoperative defects should depend on the nature of the growth and on the previous

treatment. Irradiation, if used at all, should be a secondary procedure.

The Treatment of Lingual Thyroid with Radioactive Iodine. J. A. SCHILLING, J. W. KARR, and J. B. HURSH. *Surgery*, 1950, 27: 130.

After briefly reviewing the literature concerning lingual thyroid, the authors present a case of their own in which treatment involved the use of radioactive iodine. The patient, a 30 year old white female with a beefy 4 cm. nodule at the base of her tongue, received an oral dose of 1.4 millicuries of I^{131} in 200 c.c. of water in the process of diagnosis, and 4 days later a therapeutic dose of 10 millicuries of I^{131} in 200 c.c. of water. The basal metabolic rate which before treatment was plus 1 became minus 14 per cent 2 months after treatment and the patient required .032 gm. thyroid extract 3 times per day. Two and one-half years later a small (1½ cm.), atrophic, fibrosed thyroid was found at the base of the tongue, and .032 gm. thyroid extract 3 times daily was still required. JOHN J. BALLENGER, M.D.

NECK

The Significance of Serum Cholesterol in Thyroid Disease. JOHN P. PETERS and EVELYN B. MAN. *J. Clin. Invest.*, 1950, 29: 1.

In the objective evaluation of thyroid function it has long been necessary to employ indirect methods, none of which is a specific index of the glandular activity. The determination of the basal metabolism requires the attainment of an ideal "basal state" which is not always possible. The discovery that the serum cholesterol was elevated in myxedema and in experimental hypothyroidism led to the use of cholesterol determinations as a diagnostic aid in thyroid dysfunctions. Although statistically there is an inverse relationship between the serum cholesterol and thyroid activity, in individual cases this relationship, as well as the correlation of the cholesterol with the basal metabolism, was lost. It became evident that the cholesterol was no more, probably less, specific than the basal metabolism.

An analysis of the fraction of iodine precipitated from the serum with the proteins, SPI, appears to provide a more nearly specific test for the functional activity of the thyroid gland. Under ordinary circumstances this particular fraction of the circulating iodine seems to consist chiefly of the thyroid hormone. Determination of the serum precipitable iodine is not influenced by subjective factors which interfere with the interpretation of the basal metabolism. However, the SPI is not an absolutely specific criterion of thyroid function as both excesses and deficiencies of SPI have been observed in patients in whom no disorder of thyroid function could be detected by clinical observation, other objective examinations, or therapeutic tests.

In the present series the authors compared the findings of serum precipitable iodine and cholesterol in a large number (337) of patients with and without disorders of thyroid function. Their conclusions were that serum cholesterol is of limited value in the diagnosis or control of treatment of thyroid dysfunction. Cholesterol was seen to be of no value in the detection of hyperthyroidism. When hyperthyroidism is benefited by the administration of iodine it is true that the cholesterol usually rises perceptibly, but these rises are not consistent, and are not correlated with the changes in the metabolism or other evidences of improvement. For the most part the serum cholesterol of patients with uncomplicated hyperthyroidism remains within normal limits. Frank hypothyroidism causes the cholesterol to rise to a variable degree, and when hypothyroidism is modified by therapy, cholesterol responds more rapidly than other criteria of thyroid activity. It may return to normal before the basal metabolism or SPI has been affected. With degrees of hypothyroidism intermediate between outspoken myxedema and euthyroidism, the values for cholesterol appear to be quite capricious. In addition, cholesterol is influenced by nutritive deficiencies and complicating disorders which do not affect the SPI comparably. In the detection of hypothyroidism secondary to pituitary or adrenal insufficiency, serum cholesterol is of little or no value.

WAYNE CAMERON, M.D.

Subacute Thyroiditis. GEORGE CRILE, JR., and EUGENE W. RUMSEY. *J. Am. M. Ass.*, 1950, 142: 458.

There are many synonyms for subacute thyroiditis, but struma lymphomatosa (Hashimoto) and Riedel's struma are distinct entities not related to subacute thyroiditis. Thyroiditis is divided into the acute fulminating type and the chronic type. It is essentially a self-limited disease and the symptoms respond well to roentgen therapy. The etiology is unknown; however, infections of the respiratory tract such as measles, malaria, and scarlet fever, and the possibility of a filterable virus were considered as etiologic agents. Thirty-eight patients with subacute thyroiditis were seen from 1946 to 1948. Only 5 of the 38 were men. The local symptoms were a sore throat, severe pain on swallowing, and exquisite tenderness of the thyroid gland. The pain usually radiates behind the ear of the affected side. Fatigue, weakness, and lassitude are prominent constitutional symptoms. Temperatures from 101 to 104°F. are not unusual in the acute phase followed by a low grade fever for weeks or months. Eleven patients lost weight, the average amount being 10.5 lbs. Seven patients showed symptoms of severe hyperthyroidism. The average basal metabolic rate was only +9 per cent and ranged from −8 to +28 per cent. In acute cases the average pulse rate was 103, while in chronic cases it was 84. The sedimentation rate is consistently high in the subacute form. Radioactive iodine is of little or no value. The white blood count is not elevated. The response to roentgen therapy has been prompt and complete. Thirty-five patients were treated with total dosages ranging from 250 to 2,000 roentgens, and averaging 800

roentgens, given in daily doses of 100 to 150 roentgens. Undesirable after-effects were seen in only 2 patients.

RICHARD J. BENNETT, JR., M.D.

Malignant Tumors of the Parathyroid Glands. A Review of the Literature with Report of a Case. HACK U. STEPHENSON, JR. *Arch. Surg.*, 1950, 60: 247.

The author points out the lack of common understanding of what constitutes a carcinoma of the parathyroid glands.

From the data given in many reports in the literature, it is evident that the diagnoses were in error. Carcinoma of the thyroid gland has frequently been mistaken for a malignant tumor of the parathyroid glands.

A small percentage of parathyroid tumors have been classified as malignant solely on the basis of changes in the appearance of the cells and their nuclei, and in the arrangement of these cells within the tumor mass. Alexander's report of 14 cases of hyperparathyroidism stated that cytological evidence of malignancy was observed in 13; yet in none of these did the microscopic description mention invasion of the blood or lymph channels. None of these cases showed metastasis or local recurrence.

In contrast to this report is that of Cope in which he stated that no evidence of malignancy was found in 58 cases of hyperfunctioning parathyroid tumors observed at the Massachusetts General Hospital, Boston.

The author believes that significant evidence of the malignant character of a parathyroid tumor lies not so much in the cellular picture, but rather in the evidence of invasion by the tumor cells of the capsule or the lymphatic or blood channels. It is the nature of these malignant tumors to manifest themselves first by invasion of the contiguous structures. Remote metastasis occurs most often to the lungs, and is usually late.

In a review of the literature from 1902, the author could find only 18 cases that he considered could qualify as being malignant parathyroid tumors. He had added another case from his service at the Veterans Administration Hospital, Kecoughtan, Virginia, to bring the total to 19 cases.

Malignant parathyroid tumors can be functioning or nonfunctioning. The hyperfunctioning tumors usually bring the patient under observation because of complaints associated with hyperparathyroidism, while the nonfunctioning tumor draws attention because of the mass it produces.

Guy, in a report of a nonfunctioning malignant parathyroid tumor, observed that apparently benign tumors of this structure for a duration of years might take on malignant characteristics.

Microsections of the authors case following surgery showed little cytological evidence of malignancy; however, it was clinically malignant in that it had invaded the contiguous structures, including the muscles, lymphatic vessels, and thyroid gland. The surgeon (Ernest S. Roberts) felt he had removed all the growth but local recurrence occurred and was detected 2 years later on the patient's return with symptoms of hyperparathyroidism. The patient expired following a second operation and autopsy confirmed the diagnosis of parathyroid malignancy.

Parathyroid neoplasms must be completely extirpated to adequately control these patients.

EDMUND R. DONOGHUE, M.D.

Parathyroid Osteosis Caused by a Malignant Adenoma (Ostéose parathyroïdienne par adénome malin). BERTRAND-FONTAINE and MOULONGUET. *Sem. hôp. Paris*, 1950, 26: 55.

A woman, 45 years of age, developed excessive thirst and polyuria, followed by anorexia, constipation, loss of weight and impairment of gait attributable to hypotonus of the skeletal muscles. Two years after the onset of these symptoms, a tumor appeared in the upper jaw. Curettage was done and the histologic examination demonstrated myeloplaxes. Roentgenograms showed Paget-like lesions in the vault of the skull, the right tibia, and the right scapula. An increased amount of calcium was present in the urine. A parathyroid adenoma was removed from the neck.

All symptoms disappeared after the operation, but 1 year later a recurrence of the tumor was noticed and shortly afterward all of the previous symptoms recurred in the same order as during the initial stage of the disease. The tumor could be removed only partially. The operation was followed by a rapid amelioration of the intellectual and digestive functions, improvement of gait, and disappearance of excessive thirst. Ten months later an incomplete block dissection was undertaken. The terminal stage was characterized by diffuse decalcification of the skeletal system and spontaneous fractures. The patient succumbed 11 months after the last intervention.

The author maintains that parathyroid epithelioma exerts no specific effect upon the body. Its endocrine action cannot be distinguished from that of a benign adenoma of the parathyroid glands.

JOSEPH K. NARAT, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

The Closed Head Injury: Modern Conceptions and Their Influence on Treatment. Complications of Closed Head Injuries. R. S. HOOPER. *Med. J. Australia*, 1949, 2: 840, 845.

This article from the Royal Melbourne Hospital, Victoria, Australia, is in two parts. The first part deals with the modern conceptions of closed head injuries, and the second, with the complications of closed head injuries. The recent English literature on the subject, and especially the research work, is referred to, and the article is illustrated by ingenious diagrams.

The work of Denny-Brown and Russell on acceleration injury, as well as that of the physicist, Holbourn, on shear strains is referred to. Mention is made of the lucite calvarium of Pudenz and Sheldon, and of the electrical discharge work of Walker, Kollross, and Case. On the pathologic side, Courville's descriptions are mentioned.

It is pointed out that there is little unanimity of opinion concerning traumatic cerebral edema, but reference is made to the work of Evans and Scheinker on venous vasoparalysis. Uncal herniation of the temporal lobe causes dislocation of the brain stem and this is regarded as an example of local cerebral edema. Early rehabilitation is advised.

The author believes that more attention should be paid to the nursing care of these patients, and he points out that the ordinary flat position may lead to trapping of the secretions in the pharynx and bronchi, which in turn leads to cyanosis. Postural drainage is recommended in the Sims' position. It is most important to keep an open airway. Starvation and dehydration are frowned upon and the early use of the Levine tube for feeding is recommended. Lumbar puncture is carried out at the first examination in order to establish a base from which to judge other punctures. In some cases it is used as an index of increasing intracranial pressure with the possibility of a pressure cone.

The state of consciousness is the best index of the patient's general condition, and constant check of the neurological signs is necessary.

The second part of the article deals with subarachnoid and subdural hemorrhage as well as intracerebral hemorrhage, in which the controversial delayed hemorrhage is referred to, and surgical treatment is discussed. The characteristic extradural hemorrhage and chronic subdural hemorrhage are briefly discussed. A very high incidence of extradural hemorrhage has been reported in the literature by Munro and Maltby, whose figures are quoted, and their observations are given.

Subtemporal decompression is suggested in local temporal lobe edema, though it is not clear how the presence of this entity is detected. Apparently the author has accepted the dictum of Dandy (in 1933) that 70 per cent of all patients with closed head injuries will recover without specific treatment, and of the remainder, two-thirds will die in spite of treatment. It is the remaining 10 per cent that improve and can be helped by careful management.

The article is comprehensive and instructive in its presentation of the problems of head injuries.

ADRIEN VER BRUGGHEN, M.D.

Surgical Physiology of Acute Head Trauma. BARNES WOODHALL. *Surg. Clin. N. America*, 1949, 29: 1615.

This fairly extensive review of recent experimental and clinical observations on head injuries is presented with a large bibliography. Apparently, the only serious work being done in head injuries is by the medical profession, as there seems to be very little reduction in the number of accidents which produce the injuries. The number of accidental deaths is increasing while the morbidity and mortality from head injuries are being lowered.

It is almost impossible to summarize a summary, which, in this case, would be the task. Many aspects of skull and brain injuries are touched upon and ample references are given. The author discusses the deformities of the skull, as observed by the "stress coat" technique and by the lucite cap in monkeys; the shear strains within the brain substance, which is the work of Holbourn; the various theories of concussion; and the mechanism of the formation of clots. The question of cerebral edema is briefly mentioned, but no conclusions are reached concerning it.

The question of various hitherto accepted forms of therapy in head injuries is raised, such as the use of lumbar puncture. Active and passive dehydration are mentioned only to be condemned. Full hydration and adequate nutrition are proposed, with special interest in supportive measures. A clear airway and oxygen therapy are of prime importance. Antibiotic therapy is considered the most important recent contribution in the treatment of open head injuries. One of the most significant remarks in this comprehensive discussion is quoted verbatim: "In closed head injuries, the problem has been reduced to the simple statement that all closed head injuries that are deteriorating have an operative haematoma until disproved by exploratory trephine. Such haematomas may occur as a sequel of mild and severe initial injuries." ADRIEN VER BRUGGHEN, M.D.

Aneurysm of the Intracranial Carotid Artery. Syndrome of Frontal Headache with Oculomotor Nerve Paralysis. RUDOLPH JAEGER. *J. Am. M. Ass.*, 1950, 142: 304.

Aneurysm of the intracranial carotid artery produces characteristic signs which include frontal and orbital head pains, and paresis or paralysis of the

oculomotor nerve. These symptoms are considered sufficient to make a presumptive diagnosis of aneurysm of the internal carotid artery. Thirty-one such cases are reported. They have been proved either by arteriography or intracranial exploration, or both.

Twenty-six patients were treated surgically. Six patients were considered too old or too feeble for a direct attack on the aneurysm, so that the internal carotid artery was tied in the neck. Of these, 2 had to have the ligature removed because of hemiparesis. In all patients subjected to surgical treatment, the common carotid artery was compressed digitally for several periods of 15 minutes each.

Twenty patients were treated by craniotomy. Of these, 5 died—a mortality of 25 per cent. Several methods of treatment were used: ligation of the neck of the aneurysm in 8 cases; ligation of the carotid artery on either side of the aneurysm in 8 cases; covering of the aneurysm with a layer of cotton in 2 cases. In 2 cases, other palliative procedures were performed. Death in these patients was not caused by operative shock or uncontrollable hemorrhage; all deaths were secondary to interference with the cerebral circulation. Some were embolic and others were thrombotic occlusions which the author believes could have been avoided by more experience in this type of work.

Oculomotor involvement is the most constant sign of aneurysm of the intracranial carotid artery. Occasionally, the fourth and sixth nerves may show weakness or paralysis. In one patient, the fifth nerve was cut for intractable pain. Unilateral optic atrophy was observed in 5 cases, and papilledema occurred twice on the side of the lesion and once on the opposite side. The period of symptoms ranged from 5 days to 5 years before observation.

In those patients on whom intracranial surgery was performed, it was obvious, from adhesions and pigmentation in the region of the aneurysm, that leaking had occurred. Many of the lesions were of the "berry" type and the author believes that these were cured by merely placing a silver clip on the entering vessel.

The article is condensed and should be read by all those interested in the problem.

ADRIEN VER BRUGGHEN, M.D.

Tumors of the Brain Complicating Pregnancy. CARL W. RAND and MAXWELL ANDLER. *Arch. Neur. Psychiat.*, Chic., 1950, 63: 1.

The authors present detailed studies of a series of 12 cases of cerebral lesions producing increased intracranial pressure and complicating pregnancy. Six of the patients had microscopically proved tumors: 4 astrocytomas, 1 meningioma, and 1 acoustic neurofibroma. In 3 cases of astrocytoma, both mother and baby died, 1 in the fifth, and 2 in the seventh months of gestation; in the other case of astrocytoma a large cyst was drained, and the pressure symptoms were relieved during pregnancy. The neurofibroma and the meningioma did not change significantly the course of the pregnancies, during which, however, the tumor symptoms increased. Two other patients had tumors which were not microscopically verified: a cystic cerebellar tumor incompletely removed 5 years before pregnancy and recurring after pregnancy, and a pituitary tumor which produced visual disturbances during the seventh month of gestation. In one patient with severe signs of increased intracranial pressure, the baby was delivered by cesarean section 6 weeks before term, but the mother died and autopsy was denied. The other 3 patients suffered of cerebellar malformation with hydrocephalus, arachnoid cyst, and pseudotumor cerebri.

Convulsions, nausea, vomiting, and headaches, present in several of the patients of this series, are also frequently associated with toxemias of pregnancy and must be carefully evaluated. The problems arising from the occurrence of brain tumors during pregnancy were carefully studied and the authors came to the conclusion that prompt operative intervention is indicated if a glioma is suspected. Patients with benign tumors may more safely wait if their symptoms permit. The strain of labor was thought to increase intracranial pressure and consequently cesarean section was considered preferable to spontaneous delivery. The increase in symptoms of many of the patients seemed to indicate that the neoplasms grow more rapidly during pregnancy and that, due to disturbances in water and electrolyte balance, cerebral edema accompanying the tumors is also increased. A thorough review of the literature completes the discussion of this important problem.

GEORGE PERRET, M.D.

SPINAL CORD AND ITS COVERINGS

Anterior Retromarginal Herniation of the Intervertebral Discs (Hernie discale rétro-marginale antérieure). S. DE SÈZE and J. ROTÈS-QUÉROL. *Sem. hôp. Paris*, 1949, 25: 3964.

The authors present a study of anterior herniations of the intervertebral discs, which they believe to be related to Schmorl's nodules. These herniations arise at the junction of the vertebral bodies with the margin annulus and may be the result of juvenile epiphysitis and occasionally of trauma or defective development of the epiphyseal junction. Clinically, this lesion may be associated with low back pain and stiffness of the involved vertebral segments. It may often remain asymptomatic and produce no clinical signs. GEORGE PERRET, M.D.

The Neurologic Deficit Associated with Lipomas of the Cauda Equina. ROBERT C. BASSETT. *Ann. Surg.*, 1950, 131: 109.

Congenital lipomas of the lumbosacral region may produce serious neurologic deficits which may be permanent unless the tumor is removed surgically. Since the soft but not fluctuant swelling is present at birth, and is readily visible, the condition should be recognized and treated within the first 3 or 4 months of life before long-standing mechanical traction is exerted upon the conus and cauda equina. The

neurologic damage is usually caused by prolonged traction upon the conus and cauda equina, the fixation of these structures, plus pressure upon the neural structures by the tumor mass.

Usually the lipoma is composed almost entirely of a normal, healthy, fatty tissue. Occasionally, however, in the deeper extension near the neural arches one may encounter islands of cartilage or aberrant neural elements. The fatty tissue usually extends without demarcation into the subcutaneous tissue over the gluteal regions.

The only therapy is surgical excision of the fatty tumor. After extending the skin incision through the fatty tissue and exposing the lumbodorsal fascia, a definite defect of the midline is usually delineated. The stalk must then be traced down into the neural canal. It is usually then necessary to incise the dura mater to transect the stalk about 1 cm. from the neural element. After this, by more careful and tedious dissection, the greater portion may be completely removed from the conus or the cauda equina. Occasionally it is necessary to leave small elements, but even in these cases, if the operation is performed before the symptoms have been present too long, very good improvement will occur. An interesting observation in one case was that if some of the fatty tissue is left and the patient gains excessive amounts of weight, he may have a recurrence of symptoms. This is explained by the fact that the abnormally placed tissue is undergoing normal metabolism and as the patient gains weight, the fat in the neural canal also becomes larger and hence further compresses the neural tissue. If the patient loses weight, some of the symptoms may subside.

The author presents a study of 9 cases with complete to moderate improvement in all patients but one who died as the result of a complication of meningitis. JACK I. WOOLF, M.D.

Two-Year End Results in the Total Rehabilitation of Veterans with Spinal Cord and Cauda Equina Injuries. DONALD MUNRO. *N. England J. M.*, 1950, 242: 1.

This interesting report summarizes the important work done by the author on paraplegic patients. The end results obtained in the treatment of 228 paraplegic and paraparetic veterans during a 2 year period are fully discussed. After 2 years of treatment 67 per cent of 178 discharged patients were ambulant within the limits imposed by the use of braces and crutches, but 40 patients still required longer active hospital therapy.

Spasms and mass reflexes were not constantly found in complete or partial spinal cord injuries. They could be satisfactorily relieved by bilateral anterior dorsolumbar rhizotomies. Early operation for spasms is advisable, as the spasms will not disappear spontaneously. Pain was present in one-third of the patients. Exploratory laminectomies relieved many of the patients suffering radicular or vasospastic pain. Adequate chordotomies were also successful in many instances of radicular pain, while posterior rhizotomies did not relieve any type of pain. Bedsores were present in 74 per cent of the patients on admission, and half of them required operative procedures before the sores were healed. They prevented rehabilitation in a large number of patients.

The best method of treating the paralyzed bladder is tidal drainage; it avoids overstretching or shrinkage, and fibrosis of the bladder wall. Sixty-two per cent of the discharged paraplegics had regained either 24 hour or diurnal bladder control, and 86 per cent of them had 24 hour bowel control. Failure to gain control of the bladder and bowel was due to uncorrectable physical deficiencies or unwillingness and poor co-operation of the patient. Urinary tract infections were present in 38 per cent of the patients on admission, and were thought to be the result of inadequate early bladder treatment. The author emphasizes the fact that much infection can be avoided if the size of the indwelling catheter is not larger than No. 16F.

Total rehabilitation permitting the paraplegic patient to lead a normal, although restricted, social life was achieved in 41 per cent of the patients. The author believes that if proper care is instituted immediately after the injury, at least 75 per cent of the paraplegic patients should obtain full rehabilitation.

GEORGE PERRET, M.D.

PERIPHERAL NERVES

The Importance of Ischemia in Certain Paralyses of the Peripheral Nerves (Importância da isquemia em certas paralisias de nervos periféricos). JOAQUIM BASTOS. *Gaz. méd. Port.*, 1949, 2: 603.

Several instances are cited from the author's surgical experience in which paralysis of the muscles of an extremity followed operation involving the tissues in the immediate vicinity of a nerve trunk, especially when a tourniquet had been used, or the paralysis followed some injury sustained by the patient in an accident or in his occupation (goldsmith).

In all of the patients there was an accompanying trophic vascular syndrome, and abnormal oscillometric tracings were obtained; there was always arteriographic evidence of interference with the arterial blood supply. In every case the condition responded dramatically to methods aimed at vascular dilatation in the region involved (sympathetic block).

The apparent correlation between the blood vessel and the nervous functions was noted. However, the author was dissatisfied with the divergent results and theories of causation which are found in the literature and determined to carry out experimental work in an attempt to elucidate the problem. The sciatic nerve of the dog was used. This nerve is especially adapted to such studies as this, as it has three sources of blood supply; the upper part is supplied by the gluteal artery, the midsection from the contiguous muscular arterial supply, and the lower part by the popliteal artery. Various ligations and compression

experiments on the blood supply to the sciatic nerve of the dog generally demonstrated that the blood supply to this structure is tenacious and difficult to inhibit completely. The most important finding, however, in relation to the author's problem was the fact that under ordinary conditions of ischemia the nerve tissue does not portray any observable histologic change whatever.

Another significant finding in this series of experiments was the fact that under conditions of artificial ischemia induced in the nerve, the blood vessels within the nerve itself, the so-called axial blood supply, would immediately become distended following sympathetic nerve block.

This, of course, does not prove a relationship of cause and effect; in fact, the disturbance in the blood supply and the irritative influence of the nerve seem to have a mutual influence on one another. In the case of the goldsmith, whose distal type of ulnar nerve paralysis was apparently brought on by leaning his elbow on the edge of a drawer while at work, the flexor carpi ulnaris and the flexor digitorum profundus muscles continued to function perfectly, and here again the arteriographic examination showed that the constriction of the ulnar artery was confined to its distal half. Thus, it would seem that the ulnar nerve, under pressure in the cubital fossa, irritated the ulnar artery by spasm, the artery below this point responding by a diminution in the blood supply to the distal portion of this nerve.

There are still certain doubts in the author's mind with reference to the relationship of cause and effect; consequently, he prefers not to express definite conclusions in the matter at this time, but contents himself with pointing out that in these cases there is a vascular participation, the paretic symptoms can be caused to disappear by vasodilatation methods of treatment, and that the paralyzed muscles recover as a whole, but not in the manner of recovery of the true nerve lesion with successive recovery of the muscle groups as they are reached by the creeping process of axis cylinder regeneration.

It is apparent therefore, that the disturbance is a functional one and is easily reversible.

JOHN W. BRENNAN, M.D.

Tension at the Suture Line in Peripheral Nerve Surgery. EUGENE E. CLIFFTON. *Surgery*, 1949, 26: 756.

The author has studied 303 cases of peripheral nerve sutures with regard to the degree of tension at the line of suture in relation to subsequent regeneration and functional recovery.

It is pointed out that previously tension at the suture line in neurorrhaphy was considered undesirable, and as a rule has resulted in poor regeneration. In war wounds particularly, it has been impossible to effect an end-to-end anastomosis without some degree of tension, at times a rather marked degree. A review of the cases indicated that relatively good recovery may occur after neurorrhaphy associated with some degree of tension at the line of suture. It has also been noted that the poorest results were obtained in the cases in which there was no tension of any kind at the time that neurorrhaphy was performed.

A scale of estimated tension has been set up, bearing from O (indicating a relaxed nerve without tension at the time of suture) up to 4 (indicating the maximum tension that the nerve will stand without tearing). Detailed analysis is given of the various cases with regard to the individual nerve, degree of tension, and percentage of recovery in the various groups.

End-to-end suture is considered most desirable, even though maximum tension at the suture line is necessary to accomplish this end.

Points with regard to vascular supply, extent of dissection, time of immobilization, and disruption of the suture line are discussed.

HOWARD A. BROWN, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Axillary Polymasty (Polimastia axilar). J. V. URIBURI, JR., and J. YOEL. *Prensa médica argent.*, 1949, 36: 2398.

The authors review the literature on axillary polymasty and the theories presented to explain its formation. They accept three principal types: the complete gland, the gland without a nipple, and the nipple with a rudimentary gland, or only the nipple. The last is called polythelia, and is a common anomaly in the male. The deformity can be unilateral or bilateral. The diagnosis of the first and third types is very easy, but that of the second type can be rather difficult. The most common confusion is with lipoma, of which the authors offer one case in their records. The variations of shape or sensitivity during the menstrual period or pregnancy are a valuable sign of polymasty. Diagnosis by puncture can be very useful to establish the real nature of the growth.

The extirpation is indicated for esthetic reasons, to avoid pain during menstruation or pregnancy, or prevent secretion during pregnancy. In addition, Deaver and MacFarland advocate extirpation whenever trauma may be the cause of malignant degeneration, or if malignancy is suspected.

The authors performed their operations under local anesthesia. The incision is planned according to the position of the tumor and the movements of the arm. It is always across the axilla, on the tumor and, if necessary, a section of the skin is made to remove the areola and nipple. It is advisable to extirpate the gland with a certain amount of adipose tissue because, if this tissue is left, it could give the appearance of a residual tumor. The amount of adipose tissue excised has to be gauged exactly to avoid an unsightly depression. Axillary prolongations of anomalous gland have to be kept in mind and dissected painstakingly. The cavity is drained for 48 hours. A few cases are reported.

HECTOR MARINO, M.D.

TRACHEA, LUNGS, AND PLEURA

Congenital Pulmonary Stenosis with Closed Ventricular Septum. K. D. ALLANBY and MAURICE CAMPBELL. *Guy's Hosp. Rep.*, Lond., 1949, 98: 18.

Pulmonary stenosis may be valvular or infundibular; it is nearly always valvular when associated with a closed ventricular septum. The stenosis seems to be the result of overdevelopment rather than failure of development. The most characteristic feature is the onset of increasing cyanosis and disability which occurs most often between 15 and 25 years of age. Polycythemia and clubbing of the fingers develop at the same time. Cardiac enlargement is due mainly to enlargement of the right ventricle. Roentgenograms show a prominent pulmonary artery with diminished density of the lung fields, and cardiograms show a right axis deviation.

The authors present a report of 7 cases with a closed ventricular septum. In all of these, the stenosis was valvular. The diagnosis was made at autopsy in 7 cases, and was strongly supported by clinical and operative findings in an eighth case.

In all cases the stenosis was at the site of the valve cusps. The small opening was variable in size, but usually so small that it appeared hardly large enough for the maintenance of life; however, it indicated that erroneous conclusions can be drawn from postmortem measurements. Enlargement of the right ventricle is due mainly to hypertrophy, rather than dilation. There is also an associated diffuse fibrosis, and hypertrophy of the muscle wall of the right atrium. In no case was there any abnormality of the great vessels or of the coronary vessels. No patent ductus arteriosus was found. In all but 1 case the liver was markedly nodular, tough, and fibrous.

Normally the foramen ovale is closed as the rising pressure on the left side holds the covering valve firmly over it, but this closing is not always completed anatomically. Patten found that the foramen was anatomically open at 1 year of age in 80 per cent, at 2 years in nearly 50 per cent, and even at 40 years in 20 per cent of patients. In certain cases of pulmonary stenosis, pressure on the right side will rise, and if the foramen ovale is not anatomically sealed the valve will be forced and a right to left shunt will develop, resulting in a cyanosis in a patient who was previously acyanotic. With few exceptions cyanosis is found only when there is a shunt between the right and left side.

Pulmonary valvular stenosis is generally an isolated congenital lesion. The clinical course depends upon the degree of stenosis and upon whether the pulmonary valve is anatomically closed at the time the stenosis raises the pressure in the right atrium above that in the left. If the stenosis is not severe the patient may go through life limited in his capacity for exertion but without any further developments. If both septa are completely closed, pulmonary stenosis is an acyanotic lesion, but when severe it may cause peripheral cyanosis.

ROBERT E. FLORER, M.D.

Review of 7 Years' Experience with Intracavitary (Monaldi) Drainage of Tuberculous Cavities. WARRINER WOODRUFF, WINFIELD O. KELLEY, and ALLAN STRANAHAN. *J. Thorac. Surg.*, 1949, 18: 777.

The authors discuss the formation of tuberculous cavities, and especially the mechanical factors which may enlarge a cavity far beyond the space formerly occupied by excavated tissue. They have used Monaldi intracavitary drainage as a salvage procedure, either as a palliative measure in hopeless cases

or as a method to prepare certain patients for collapse therapy. This latter method is used often in the hope of reducing the cavity in size so that a less extensive thoracoplasty can be done, or that one can be done at all.

Technically, a large tension cavity with little surrounding disease, and situated in the upper lobe, is the most ideal problem. Lower cavities, which should be drained posteriorly, are difficult in that a posteriorly located tube interferes with the normal thoracoplasty incision, may be dislodged by scapular motion, and is often uncomfortable.

Contraindications are (1) a history of profuse hemorrhage, (2) a free pleural space, (3) a cavity too small to enter with a trocar, or which is inaccessible to safe and simple drainage (such as near the hilum), and (4) multiple cavitation so extensive that even successful drainage of one or two cavities would offer no reasonable hope for palliative relief.

The procedure is done in two parts: the first part consists of obliteration of the pleural space after resection of the first and second ribs and the intercostal muscles, if there is no pleural adhesion, and the second, insertion of the catheter 2 or 3 weeks later. If later thoracoplasty is contemplated, small segments of ribs are removed so that the maximum amount of thoracoplastic collapse can be obtained. The catheter is inserted preferably under fluoroscopic control.

Complications have included (1) hemorrhage in 20 per cent of patients, which proved fatal in 1 case, (2) air embolism in 1 case, (3) small pneumothoraces, and (4) empyema in 1 case.

Postoperatively, suction is applied after 24 hours. This is continuous and at minus 20 to minus 30 cm. of water pressure. Suction is discontinued temporarily if frank bleeding occurs. If small abscesses develop around the site of catheter emergence these are incised and drained. Streptomycin has cleared many of these abscesses promptly. Catheters are replaced monthly.

Results were good, both immediately and later. Early there were increase in appetite, decrease in fever and toxicity, and marked decrease in cough and expectoration. Short term results were cavity closure without further therapy in 40 of 82 cases, 33 of these within 6 months. In 33 cases the cavities became smaller and in 9 cases they remained unchanged or increased in size.

Late results were encouraging in that 40 cavities which closed remained so for periods ranging from 8 months to 4½ years; 11 others closed but re-opened in from 3 weeks to 59 months.

When a catheter should be removed is not definitely known. One patient has been wearing hers since August, 1940 in spite of having a negative sputum for several years. She is unwilling to have it removed. When surgical collapse or resection is to be done the catheter is left in place until the surgery has been completed and, if possible, the ribs have regenerated. The sinus usually heals rapidly.

BEATTY H. RAMSAY, M.D.

Tumors with the Syndrome of Pancoast (Tumoren mit Pancoastsyndrom). OTTO WICHTL. *Aerztl. Wschr.*, 1949, 4: 680.

The author has been ferreting through the records of the roentgenologic department of the Hanusch-Krankenhaus in Vienna, Austria, in search for anything bearing on the subject of Pancoast's syndrome, and turns up with a collection of oddments.

A 45 year old railroad worker developed the complete syndrome, including pains in the shoulder, symptoms of injury to the lower brachial plexus branches, Horner's syndrome, and eroded first rib. The pains and paretic phenomena increased under irradiation therapy; however, the infiltrating processes seemed to regress somewhat, the first rib reconstituted itself, and the man lived for 20 months after the onset of the symptoms, the usual survival period being 9.5 months according to Lindgren.

In a 48 year old male the presence of a tumor in the upper pulmonary sulcus was demonstrated by planigraphic roentgen exposures before any evidence of bone erosion had developed. Autopsy disclosed a rather small-celled carcinoma on the apex of the lung, growing into its cicatricial adhesion with the cupular pleura.

A 47 year old male developed shoulder pains and mydriasis on the same side. Glandular metastases in the hilus region aroused the suspicion that a peripheral bronchial carcinoma was present. However, the patient died of cerebral metastases before a Pancoast syndrome could fully develop.

A 63 year old woman developed a typical Pancoast syndrome with roentgen evidence of bone erosion of the second rib. She had been operated upon for hypernephroma, and doubtless this was the character of the tumor (metastasis) in the upper pulmonary sulcus. Roentgen treatment effected palliation of the patient's suffering but did not hold up the eventual demise of the patient. The author believes that the symptomatic alleviation in this case of an admitted radiorefractory tumor permits of the postulation in this instance of a more expansive, rather than infiltrative, growth of the metastasis.

A 41 year old woman, who had undergone mammectomy for carcinoma of the breast and later was reoperated upon for metastatic glands in the corresponding axilla, developed a Pancoast syndrome with roentgen evidence of tumor in the upper pulmonary sulcus on that side. The condition was not influenced by irradiation therapy. The author mentions the similarity between this case and that described by Bruns in 1898 (*Arch. Psychiat.*, 1899, 58:536).

A 70 year old woman developed a Pancoast syndrome in connection with what was evidently a sarcoma of the upper pulmonary sulcus. With irradiation therapy the Horner's syndrome and other neurologic manifestations disappeared and have not returned. The tumor mass shrank to about half its largest size and has not shown any evidence of growth activity for 2 years.

This series of cases shows that many other tumors than the branchiogenic cancer, postulated by Pan-

coast, may produce a typical Pancoast syndrome. It also shows that a Pancoast syndrome may be partial, or not yet fully developed, and still be a true syndrome. Other than cases of tumor may exhibit symptoms suggestive of the Pancoast syndrome; however, the symptomatology is seldom so typical as in the case of tumor, and the author believes that the designation "Pancoast syndrome," or "partial Pancoast syndrome," is not justified for other than tumor cases. JOHN W. BRENNAN, M.D.

Fibrosarcoma of the Bronchus. Report of A Case Diagnosed by Bronchoscopy and Treated by Pneumonectomy. JAMES CARSWELL, JR., and NELSON H. KRAEFT. *J. Thorac. Surg.*, 1950, 19: 117.

The authors discuss the literature on fibrosarcoma of the bronchus and the rarity of this condition. A case is reported of a patient who complained of severe pain in the left chest with cough and marked weight loss. X-ray examination of the chest showed atelectasis of the left lower lobe. Bronchoscopy revealed a smooth surfaced tumor occluding the left main stem bronchus. A large biopsy section was taken, following which the obstruction in the lower airway was relieved, and the atelectasis of the lobe cleared. The pathological report showed the bronchial mucosa to be normal except for areas of squamous metaplasia. Underneath the mucosa was a fibroblastic neoplasm with areas of cellular whorl formation and strands of collagen. The cells were hypochromatic but without increased mitotic activity. A diagnosis of fibrosarcoma was made, and shortly afterward pneumonectomy was performed. Careful exploration revealed no evidence of regional metastatic involvement. Examination of the surgical specimen showed the pathologic lesion to be confined to the left main bronchus, and the pathologic histology was that observed in the biopsy specimen. Postoperative bronchoscopy has failed to indicate any evidence of local recurrence. Local excision with fulguration would not have eradicated this tumor because it involved the full thickness of the bronchial wall and extended between the cartilaginous rings. BENJAMIN G. P. SHAFIROFF, M.D.

The Role of Partial Pyopneumothorax in Endothoracic Suppurations (La place des pyopneumothorax partiels parmi les suppurations endothoraciques). CH. MATTÉI, M. TRISTANI, A. BARBE, and J. CHOUX. *Presse méd.*, 1949, No. 81: 1187.

Of 100 patients expectorating pus, without signs of tuberculosis, 40 per cent had a lung abscess, 35 per cent had suppurative processes in preformed bronchopulmonary cavities, and 25 per cent had pyopneumothorax. The most frequent type of the latter condition was partial posteroinferior pyopneumothorax. Basal location of a pus pocket is presumptive evidence of partial pyopneumothorax. Contrary to popular opinion, lung abscess is rarely located in the lower lobe.

In 50 per cent of the cases pyopneumothorax followed an infection of preformed bronchopulmonary cavities or suppurating bronchiectasis. In 30 per cent a propagation of infection from parenchymal lesions, especially lung abscesses, could be demonstrated. In the remaining 20 per cent, unjustified, repeated exploratory paracentesis of the chest was apparently responsible for the condition.

Partial pyopneumothorax can be distinguished in many instances from an intrapulmonary abscess only by means of lipiodol. In 15 per cent of the authors' material the radiopaque substance reached the pleural pocket through a bronchial fistula. In doubtful cases a transparietal injection of iodized oil may be employed. A characteristic displacement of the shadow may be obtained by changing the position of the patient.

With the exception of apical pockets, partial pyopneumothorax should be treated with endopleural injections of 1,000,000 units of penicillin in 5 c.c. of physiologic saline solution every second day. In putrid effusion the dose should be doubled and 0.5 gm. of streptomycin should be added. From 4 to 6 injections usually suffice to obtain a cure. Such treatment is useless or even dangerous if one is dealing with intraparenchymal collections of pus. Partial apical pyopneumothorax cannot be easily reached by punctures and requires employment of the endobronchial route. The same approach is indicated whenever lipiodol injections have demonstrated the presence of bronchial fistulas. The local treatment may be supplemented by intramuscular injections of 1,000,000 units of penicillin daily, while injections of 2,000,000 units on 14 successive days may cure the condition without local treatment. "Closed" endopleural penicillin therapy is far superior to injections of antibiotics through a drain.

JOSEPH K. NARAT, M.D.

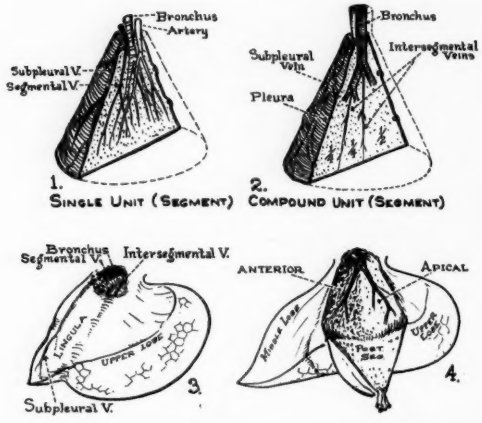
The Surgical Management of Chronic "Spontaneous" Pneumothorax. Report on the Etiological Factors and Surgical Treatment Employed in 15 Cases. LYMAN A. BREWER, III, FRANK S. DOLLEY, and BYRON H. EVANS. *J. Thorac. Surg.*, 1950, 19: 167.

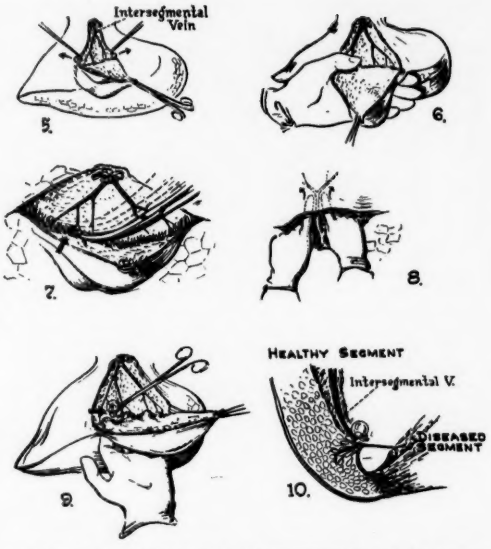
Failure of the collapsed lung to re-expand after an attack of spontaneous pneumothorax results in chronic invalidism and may contribute to a fatal outcome.

Most of the patients thus far have been treated with chemical irritants, whereas surgical measures have been employed rarely and only during the past year. They include closed catheter drainage, phrenic paralysis, thoracoscopy with internal pneumonolysis, and thoracotomy.

Surprise is expressed over the fact that decortication, standardized during World War II, has not been more generally applied to these cases. The recognition of a pleural membrane has been overlooked in the past and its significance has rarely been appreciated. Rapid expansion of the lung following decortication is advised if minimal pleural thickening is to be obtained.

STEPHEN A. ZIEMAN, M.D.





Segmental Pulmonary Resection. Details of Technique and Results. Richard H. Overholt, Frances M. Woods, and Beatty H. Ramsay. *J. Thorac. Surg.*, 1950, 19: 207.

Pulmonary segmental resection has, since its conception, gone through periods of enthusiasm, of doubt, and of progress. Gradually, through successive improvements by various individuals (briefly mentioned), it has reached a point where the method of separating diseased segments from adjacent normal ones can be given in meticulous step-by-step maneuvers. With the method described in the article postoperative complications have been markedly reduced so that in 28 consecutive segmental resections of most segments and combinations of segments there were no empyemas and only 2 minor fistulas. There was 1 death from pulmonary insufficiency. The average hospitalization was 14.0 days.

The technique as described features the use of the intersegmental veins as guides to the plane of intersegmental dissection. The correct vein is distinguished at the hilum of the diseased segment after the segmental bronchus and artery have been dissected free and ligated. The intersegmental vein does not closely accompany the bronchus and artery but runs toward the junction between the diseased and normal segments. When a given segment adjoins two other segments there is usually a separate intersegmental vein for each surface.

The actual intersegmental separation is a delicate process. Emphasis is placed on gentleness and good exposure. The latter is obtained by irrigating the surface free from blood and by keeping it flattened out. Flattening out is produced by retracting the segmental margins outward with gauze pledgets and by keeping the adjacent normal lung tissue inflated. Counterpressure from the pleura with a flat surface is of definite aid at times. Any fibrous bands and venous branches should be cut with a scissors so that the lung parenchyma is not torn with resulting air leak or contamination. Dissecting pressure should be directed along the intersegmental plane and not against the normal segment. The separation can be

Fig. 1 (Overholt *et al.*). Our conception of the structural arrangement of the pulmonary unit. Note the central bronchus, artery, and segmental vein and the peripheral subpleural vein.

Fig. 2. When such units are combined to form compound units or segments, some of the subpleural veins become intersegmental. The surgical segment illustrated here is shown divided into two quarter segments and a half segment corresponding to bronchial branching. Intersegmental veins demarcate the planes of separation.

Fig. 3. A dissection of the hilum of the lingula: a subpleural vein is noted on the surface, a segmental vein accompanies a bronchus, and an intersegmental vein is shown between the lingula and the remainder of the upper lobe. Note that an intersegmental vein does not accompany an artery or bronchus.

Fig. 4. Segmental resection of the posterior segment of the right upper lobe is almost completed. Note the two intersegmental veins remaining on the freshly dissected surfaces of the anterior and apical segments.

Fig. 5. Dissection of the intersegmental plane is facilitated by flattening the plane out by divergent retraction of the edges and inflation of the lung.

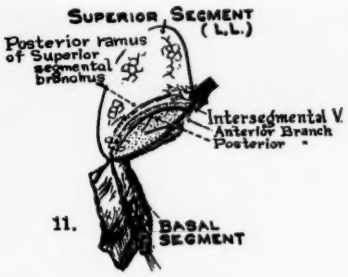
Fig. 6. As the plane is developed, counterpressure from the pleural surface aids dissection.

Fig. 7. This illustrates the side-to-side dissecting motion and division of a venous branch.

Fig. 8. If the tissues of the intersegmental plane are normal, segments can be separated cleanly by divergent motion of the fingers inserted along the intersegmental vein.

Fig. 9. Alveolar damage and air leak are illustrated. An incorrect type of counterpressure is shown. Note the flat side of the hand in Figure 6.

Fig. 10. Undue traction on venous tributaries may be transmitted to the normal segment with resultant parenchymal tears.



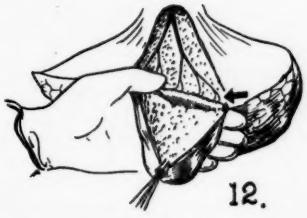


Fig. 11. The posterior ramus of the superior segmental bronchus lies close to the intersegmental surface between the superior and basal segments of the lower lobe; it is easily injured.

Fig. 12. The intersegmental veins are followed clear to the pleura before the latter is divided.

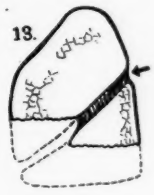


Fig. 13. Adhesions between remaining parts of the lung are left intact to prevent torsion.

Fig. 14. Control of significant air leaks is obtained by grasping and ligating the margins. Attempts to suture result in larger leaks.

Fig. 15. Obstruction of the vein from the superior segment of a lower lobe may lead to engorgement of the segment. This may occur when exposing the basal bronchus for resection of the basal segments of a lower lobe.

most readily carried out, when the parenchyma bordering the plane is normal, by inserting two index fingers along the axis of the intersegmental vein and then moving them divergently along the lateral veinous branches.

Various sources of error are pointed out. These include cutting of the bordering parenchyma without following the venous branching, "digging-in" by dissecting with pressure against the parenchyma, damage to the good adjacent segment by pulling on venous branches, and obstructing the venous drainage from a good segment by kinking or pressure during the separation. A new complication of engorgement of a remaining segment, produced by the latter error, is described.

The divided branches of the intersegmental veins are ligated, and significant air leaks from the remaining bare surface are controlled by grasping the margins of the leak with forceps and ligating the tissue so approximated. The suturing of air leaks has not been so successful, having many times increased the amount of damage. The bare surface is left uncovered so as not to limit the re-expansion of the remaining segments to fill the hemothorax. Two catheters are placed intrapleurally for drainage and are left until all air leak has ceased and the remaining parenchyma has completely re-expanded. This generally takes less than 48 hours.

TABLE I.—SEGMENTS REMOVED

Right lung		Left lung	
Upper lobe Posterior	1	Upper lobe Lingula and anterior	1
Anterior	1	Inferior lingular	2
Anterior subsegment	1	Lingula complete	8
Middle lobe Medial	1	Lower lobe Superior	1
Lower lobe Superior	3	Subsegment of superior Lateral basal	1 1
Medial basal	1	Basal group	11
Basal group	4		
Medial and posterior basal	1		

TABLE II.

Complications		
Empyema		0
Fistula		2
1st degree	1	
2nd degree	1	
3rd degree	0	
Death		1
Engorgement of superior segment		2
Total		5

In addition to the use of segmental resection in bronchiectasis and chronic abscess, its use is recommended in the single pulmonary lesion of unknown etiology at the time of thoracotomy for diagnosis. In this way an anatomical operation is performed and if the lesion proves benign the correct procedure has been done and the maximum amount of normal lung is preserved.

A complete set of diagrams outlining the basic concept of the pulmonary unit is given (Fig. 1) and the combination of one or more of these to give compound units, segments, and lobes (Fig. 2). The relationship of the veins, intersegmental and segmental, is thus explained. The other diagrams illustrate the various technical maneuvers.

BEATTY H. RAMSAY, M.D.

HEART AND PERICARDIUM

Stab Wound of the Heart Followed by Temporary Cessation of the Heartbeat With Resuscitation by Cardiac Massage. A Clinicopathologic Study of 1 Case of 30 Days' Survival. AAGOT CHRISTIE LÖKEN, WEBB HAYMAKER, and DONALD L. PAULSON. *Surgery*, 1949, 26: 745.

The authors briefly review the literature on cases of cessation of the heartbeat and resuscitation by manual massage. In addition, they report 1 case with careful histologic studies in which a 29 year old colored man suffered complete cardiac arrest for an estimated period of from 3 to 5 minutes. The patient was resuscitated but died 30 days later.

Although the precipitating cause of death was pneumonia, the histologic examination revealed, in addition, severe damage of the brain. The brain damage consisted mainly of the disappearance and degeneration of ganglion cells and the replacement by microglia and a smaller number of astrocytes. The cerebral cortex was a site of predilection with the calcarine cortex bearing the brunt. The latter observation was emphasized because of the visual disturbances that may occur with nonfatal anoxia. Other severely affected structures were Sommer's sector of the hippocampus, the thalamus, striatum, cerebellum, and medial geniculate body. The white matter of the cerebrum was virtually spared.

W. FOSTER MONTGOMERY, M.D.

Cardiac Lesions Following Venous Catheterization of the Right Auricle and Coronary Sinus of Dogs. WILLIAM G. BANFIELD, DONALD B. HACKEL, and WALTER T. GOODALE. *J. Laborat. Clin. M.*, 1950, 35: 287.

Despite the fact that serious sequelae following venous catherization of the heart in man have been observed only in 1 instance, a study was undertaken for the purpose of evaluating the effects of the procedure. Dogs were used as experimental animals.

The auricle and coronary sinus were catheterized as atraumatically as possible. Thrombi and subendocardial hemorrhage, in some instances associated with small myocardial hemorrhages, were found on autopsy 48 hours later. Altogether, 18 dogs were used, 12 having the right auricle catheterized and 6 the coronary sinus. The site of the lesions was relatively constant, occurring where the catheter tip or shaft impinged on the endocardial surface. Lesions, although small, were even found when the simplest possible procedure, such as catheterization of the auricle alone, was employed.

Why the human heart is immune to these complications may be attributed to differences in the clotting mechanism, a slower heart rate under nembutal anesthesia, a fixed mediastinum, the inconspicuous auricular muscle above the fossa ovale, and, fortunately, the fact that most catheterization procedures in man are not followed by autopsy.

STEPHEN A. ZIEMAN, M.D.

The Surgery of Mitral Stenosis. CHARLES P. BAILEY, ROBERT P. GLOVER, and THOMAS J. E. O'NEILL. *J. Thorac. Surg.*, 1950, 19: 16.

In this rather comprehensive article the background data, as well as the technical developments justifying and permitting the consideration of surgical correction of stenotic mitral valves, is reviewed. The anatomic, pathologic, and physiologic changes occurring as the consequence of a stenotic mitral valve are outlined.

With regard to the possible approaches to relieving the train of morbid changes resulting from mitral stenosis, three principal categories are considered. These are described (Methods 1, 2, and 3).

TABLE I.—MITRAL STENOSIS

	Date of operation	Type of operation	Result
1	11/14/45	Attempted valvulotomy	Death on table
2	6/12/46	Digital dilatation	Death after 60 hours, thrombosis at valve site
3	3/22/48	Commissurotomy	Death after 6 days, technical difficulty
4	5/21/48	Exploratory	Death on table after pericardium incised
5	6/10/48	Commissurotomy	Living, excellent result
6	6/27/48	Commissurotomy	Living, excellent result
7	7/13/48	Commissurotomy	Death after 7 days, sudden cerebral embolus
8	8/ 2/48	Simple incision cusp	Death after 3 months, mitral regurgitation
9	9/ 2/48	Simple incision cusp	Death after 24 hours, mitral regurgitation
10	9/ 2/48	Commissurotomy	Death after 24 hours, hemorrhage
11	9/10/48	Interauricular shunt	Death after 60 hours, diminished cardiac output
12	9/16/48	Digital dilatation	Living, greatly improved
13	2/ 1/49	Digital dilatation	Death after 60 hours, cardiac failure
14	2/ 2/49	Commissurotomy	Living, excellent result
15	3/23/49	Commissurotomy	Living, excellent result

Fig. 1 (Bailey *et al.*). Commissurotomy knife inserted between two gloves on the palmar surface of the right index finger.

1. Methods of by-passing the stenotic mitral valve. The work along these lines has been done experimentally and seems to offer little of practical value.

2. Methods of relieving the associated pulmonary hypertension. The various methods that have been employed include: (a) removal of the accelerator and afferent nerve supply to the heart (Harken); (b) destruction of the tricuspid valve to reduce the right ventricular output; (c) production of a shunt between the pulmonary and systemic venous systems (Sweet); and (d) creation of intra-auricular septal defects (Harken, Bailey, *et al*). Whereas such procedures may bring about some degree of palliation, it can only be considered temporary.

3. Methods of direct surgical attack on the stenotic valve. These have included: (a)simple incision of a valve cusp; (b) simple excision of the valve ring; (c) digital dilatation of the stenotic valve; (d) valvuloplasty (Harken), by which is meant resection of portions of the valve ring in the region of the commissures; this approach is believed to relieve stenosis, but seems to accept regurgitation; and (e) commissurotomy (Bailey *et al.*), which is performed transpleurally on the left. The pericardium is opened. The left auricular appendage is encircled by a purse string suture. With a clamp (Satinsky) for temporary occlusion, the tip of the appendage is amputated. With two rubber gloves on the operator's hand, the specially designed commissurotomy knife is placed along the volar aspect of the index finger between the gloves. The finger

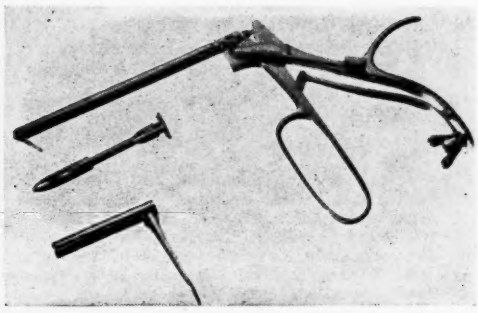


Fig. 2. Narrow-bladed commissurotomy punch with trocar and cannula.

is inserted into the auricle through the portal of the auricular appendage as already prepared and the mitral valve is palpated. After identification of the proper site for sectioning, along the fused portions of the valve (the commissures), the knife is advanced along the finger and engaged in the orifice. A backward stroke severs the valve. The palpating finger then determines the state of adequacy of the sectioning. Use of a left cutting blade permits cutting of both commissures by simple rotation of the wrist. At the conclusion of the procedure, the finger is withdrawn with the knife. The auricular appendage is ligated and oversewn. The chest is closed with drainage, with the pericardium left open.

Since the chief seat of the fibrotic changes in the mitral leaflets in rheumatic fever is along the margins with fusion of the leaflets at the commissures, reopening along the commissures relieves the stenosis and permits them to function in preventing regurgitation. Extremely dense or calcified valves may require the use of a backward cutting punch to section along the commissures.

The results in all of the cases of mitral stenosis treated surgically are given in table form. A footnote reveals that 7 additional commissurotomies have been done with only 1 death since publication.

The indications as formulated at present are:

1. Most favorable group:
   - a. Excessive fatigability
     Increasing exertional dyspnea
   - b. No rheumatic activity
     Normal sinus rhythm
     Lesion predominantly stenosis
     Evidence of significantly increased pulmonary hypertension
2. Less favorable group, which includes some of the preceding group.
   - a. Recurrent bouts of hemoptysis
   - b. Arterial embolic phenomena
   - c. Auricular fibrillation without failure

The contraindications are:

1. Active rheumatic infection
2. The presence of superimposed subacute bacterial endocarditis

3. Cardiac failure uncontrollable by medical means.
4. The presence of marked associated mitral regurgitation or other valve deformities of the aorta.

The 15 case reports are given concisely.

HIRAM T. LANGSTON, M.D.

Azygopulmonary Anastomosis in the Treatment of Edematous Mitral Stenosis (L'anastomose veineuse azygo-pulmonaire, dans le traitement du rétrécissement mitral oedémateux). F. D'ALLAINES, J. LENÈGRE, C. DUBOST, L. SCÉBAT, A. MATHIVAT, and J. LE BRIGAND. *Mem. Acad. chir.*, Par., 1949, 75: 705.

In 11 cases of edematous mitral stenosis favorable results were obtained by azygopulmonary anastomosis. This palliative treatment was first employed by Bland and Sweet. The condition occurs mostly in young women and causes dyspnea on exertion, hemoptysis, and recurrent crises of acute pulmonary edema. Signs of venous stasis or right cardiac failure are absent. Digitalis is ineffective. The influence of the menstrual cycle is very marked in a large percentage of cases, the symptoms appearing usually from a few days to a few hours before the onset of menstruation. The symptoms nearly always coincide with the clinical syndrome of hyperfolliculinism and increase in weight.

Radiokymographic studies frequently demonstrate systolic expansion of the left auricle. Observations during operation confirm such findings. Electrocardiographic recordings show the presence of a regular sinus rhythm and hypertrophy of the right ventricle.

While there is hypertension in the pulmonary circulation, the blood pressure in the right auricle and the superior vena cava remains normal. In the right ventricle the pressure may rise from the normal level of 15 cm. of water to 50 cm., in the pulmonary artery from 25 cm. to 70 cm., and in the left auricle from 10 cm. to 40 cm. The purpose of the operation, therefore, is the establishment of a shunt, to direct the excess of pressure in the pulmonary arch toward the right auricle. A terminolateral anastomosis is established between the right superior pulmonary vein and the vena azygos magna by means of anterior approach on the right side. If the vena azygos cannot be utilized, a lateral anastomosis with the vena cava superior can be performed. The operation is less dangerous than the establishment of an interauricular communication. It is done on nonvital blood vessels; therefore, in case of a rupture or an inadvertent laceration, the involved pulmonary vein or vena azygos can be ligated. Because of the relatively small diameter of the vena azygos magna, the short circuit is of a small caliber and does not reduce markedly the cardiac output, which is already diminished in patients with mitral stenosis. The higher the blood pressure is in the right auricle and in the pulmonary vein, the more effective the shunt will be. In other words, an automatic regulatory mechanism is established. Three of the patients operated on died; in 1 patient no improvement was obtained, in 2 patients a transient relief of symptoms was recorded, and in 5 a marked improvement had continued when they were reexamined from 3 to 8 months after operation. Insufficiency of the right ventricle constitutes a definite contraindication to operation. JOSEPH K. NARAT, M.D.

Anesthesia for Operations on the Heart and Great Vessels. G. A. LIGHT, H. M. LIVINGSTONE, and W. E. ADAMS. *Arch. Surg.*, 1950, 60: 42.

The authors have made a study of 60 operations on the heart and great vessels over a 10 year period. Ligation of a patent ductus arteriosus and the Blalock or Pott's operation constituted 50 per cent. There were 4 postoperative deaths and 2 operative deaths. Ethylene oxygen, either alone or with another agent, comprised 48 of the induction anesthesias. A relatively standard method of caring for the patients was adopted, and varied according to specific factors. Cyclopropane was avoided because of its questionable effect upon the heart action and vagal reflexes. The method by which this agent would have to be given contraindicated its use, since the "closed" system necessarily increases the anesthetic "dead space" so that a tidal volume must be increased in order to wash out the alveolar spaces adequately.

Postoperatively, oxygen was administered for at least 24 hours, and longer if necessary.

In addition to the 60 operations there were 16 diagnostic catheterizations of the heart conducted in the fluoroscopic room. Tribromethanol solution or thiopental sodium given by rectum constituted the induction which was given in the patient's room. The procedure of cardiac catheterization is discussed and the duties of the anesthetist are outlined.

STEPHEN A. ZIEMAN, M.D.

Coarctation of the Aorta. H. BRODIE STEPHENS and ORVILLE F. GRIMES. *J. Thorac. Surg.*, 1949, 18: 804.

In the adult type of coarctation, a sharp constriction or obliteration of the descending aorta occurs at or near the insertion of the ductus arteriosus. The aorta proximal to the coarctation is especially likely to develop inflammatory or degenerative changes, the exact cause of which is unknown. There is no doubt that coarctation of the aorta shortens the life of the individual. Cardiac decompensation, spontaneous rupture of the aorta, cerebral accidents, and mycotic endarteritis are the most frequent causes of death.

The authors review their experience with 15 patients who underwent operation for coarctation of the aorta. There were 4 deaths in the series, 1 of which was an operative mortality. The remaining 3 fatalities occurred in the immediate postoperative period from exsanguinating hemorrhage because of local necrosis at the line of anastomosis. One area of necrosis apparently occurred in an area of atherosclerosis traumatized by an occluding aortic clamp.

A brief review of the literature indicates that there is an over-all mortality rate of 22.5 per cent for the surgery of coarctation of the aorta. Most of the reported deaths have occurred in the older age groups and the most common cause of death has been hemorrhage, usually at the line of anastomosis. It is quite generally agreed that an end-to-end aortic anastomosis is the procedure of choice.

There are probably no absolute contraindications to surgery of the adult type of coarctation of the aorta. In most instances, surgery remains the only hope even for those in whom the operative risks are great. Within the realm of reason, these patients should be offered the benefit of operative therapy.

The successful use of preserved arterial grafts to bridge the aortic defects produced by the resection of elongated areas of coarctation in the experimental animal has led recently to cautious applications of these grafts to human patients.

ORVILLE F. GRIMES, M.D.

ESOPHAGUS AND MEDIASTINUM

Esophageal Atresia and Tracheoesophageal Fistula. WILLIS J. POTTS. *Med. Clin. N. America*, 1950, 34: 247.

Atresia of the esophagus may occur without any communication with the trachea, it may occur where the upper end of the esophagus communicates with the trachea or the lower segment, or where both segments communicate with the trachea. In approximately 85 per cent of cases it occurs where the lower segment opens into the trachea at or near the corina, the upper segment terminating blindly.

The diagnosis is based on excessive salivation and frothy mucus in and about the mouth of a newborn infant, cyanosis, choking, prompt vomiting of all fluid offered, and inability to pass a small catheter into the esophagus.

The mortality is high. With operation, it ranges from 50 to 80 per cent; without operation it reaches 100 per cent. Any procedure which can cause a reduction of this rate seems rational despite the alarming high rate of fatality. One of the principal difficulties, however, is the poor risk of a generally underweight infant.

Preoperative care is of the utmost importance; however, one cannot delay operation, since pulmonary complication may be present. The operation of choice is closure of the tracheoesophageal fistula and end-to-end anastomosis of the segments of the esophagus, to be followed the next day by a gastrostomy. The anastomosis is made over a No.8 or No.10 French catheter.

After a period of about 1 week the infant is made to swallow a string, one end of which is brought out of the gastrostomy wound and tied to the other end. The string is later used as a guide during dilatations of the esophagus. The gastrostomy wound is kept open for this purpose.

Potts reviews a series of 20 cases, with a survival rate of 7. Despite the formidable mortality it is believed that a step forward has been accomplished in relieving these poor risk patients and giving some at least a chance for life. STEPHEN A. ZIEMAN, M.D.

Cancer of the Esophagus. COLMAN K. BYRNES. *Irish J. M. Sc.*, 1950, No. 290: 59.

The average duration of symptoms from cancer of the esophagus varies from 9 to 12 months, dysphagia being the usual symptom. Diagnosis should be established both by x-ray and esophagoscopic examination. When the diagnosis is established, the relief obtained from resection justifies exploration in every patient who can be rendered a fair surgical risk, even though cure cannot be accomplished.

FRANK B. QUEEN, M.D.

MISCELLANEOUS

The Role of Angiocardiography and Venography in Mediastinal and Paramediastinal Lesions. OSLER A. ABBOTT, WILLIAM A. HOPKINS, and TED F. LEIGH. *J. Thorac. Surg.*, 1949, 18: 869.

The authors attempt to evaluate the results of experiences in the use of angiocardiography and venography as a diagnostic aid in the differential diagnosis of tumors in the mediastinum and paramediastinal areas. The problem is attacked under such headings as those which follow:

1. Angiocardiography as a method of differential diagnosis between vascular and avascular mediastinal and paramediastinal lesions.

2. How much diagnostic information can be obtained from this method in relation to nonvascular tumors in these areas?

3. What is the relative place of angiocardiography in the study of mediastinal and paramediastinal masses?

4. What are the special technical problems associated with venography and angiocardiography in the different types of mediastinal lesions encountered?

5. Of what value can angiocardiography be in the study of certain primary pulmonary lesions—in particular, pulmonary neoplasms?

Each proposition is exemplified by case histories.

It is concluded that there is a definite place for the use of these methods in the study of mediastinal and paramediastinal masses; that the methods, moreover, provide the most valuable signs of differentiation presently available; that although the method of investigation has definite use it is considered of limited value in the study of nonvascular tumors. Its prime function here is to aid in better localization of the lesion and in giving better outline of its borders. Angiocardiography as a method of study has variable value. It is considered an absolute necessity in the study of all lesions of the middle mediastinum and superior mediastinum if they are located in the right paramediastinal area.

It is vitally necessary that careful fluoroscopic examination and multiple x-ray projection studies be carried out before determining the particular positions and combinations of angiographic methods to

be used. In bronchiogenic carcinoma, especially in lesions of the upper lobe, angiocardiography is of specific value; it is of value also in distortion of the vascular pattern in patients with advanced pulmonary emphysema of the type known as "vanishing lung disease."

The discussion that followed rang a note of caution regarding the selection of patients, the use of the opaque medium, the tying off of the distal carotid, and the fact that the procedure is not without some risk, several fatalities being reported.

STEPHEN A. ZIEMAN, M.D.

Thymectomy in Myasthenia Gravis. HENRY R. VIETS. *Brit. M. J.*, 1950, 1: 139.

The problem of the thymus in myasthenia gravis is well presented. The discussion concerns 36 patients whe were operated upon at the Massachusetts General Hospital, Boston, from 1941 to August, 1949, and each case is discussed individually.

The author suggests that 15 mgm. of neostigmine bromide taken by mouth is equivalent to 0.5 mgm. of neostigmine sulfate given subcutaneously or intravenously. In one fatal case the patient received seven times this dosage. Another factor is anesthesia, and the author has changed from gas-oxygen-ether to cyclopropane anesthesia. Prolonged exploration may also be a factor in deaths from thymectomy. In general, patients with marked involution of the thymus at operation have not had the most favorable results. In some cases improvement was good, but quite delayed. In one patient 57 tablets of neostigmine per day were given after the operation. The author states that the "deficiencies" must be made up no matter what amount is required. Most instances of resistance to the drug are found to be due to underdosage. The author controls the patient by oral medication, without operation, when the adequate maintenance dosage of neostigmine is 12, or fewer, tablets a day.

In a myasthenic individual, the finding in the roentgenogram of a mass in the anterior mediastinum indicates, with a high degree of probability, the presence of a thymoma. Castleman and Norris state: "By and large the thymoma of myasthenia gravis should be considered as a benign neoplasm." In some cases re-exploration is necessary in the hope of finding an aberrant thymus. Thymectomy should never be undertaken as an operation of desperation. In cases of relapse the patient presents such a severe surgical risk that operation under these circumstances is not justified. Without adequate neostigmine maintenance during anesthesia operations are often hazardous. When an anterior mediastinal mass which is clearly not an aneurysm is observed, by x-ray, in a patient whose full and detailed history reveals some symptoms of abnormal fatigue of voluntary muscles, no matter how slight, with recovery on rest, a diagnosis of myasthenia gravis, with thymoma, must be entertained.

Neostigmine methylsulfate, administered intravenously, is usually given with 1,500 c.c. of dextrose or saline just before, during, and after operation. If the patient cannot swallow at the end of 24 hours a second drip may be started.

Of the 36 patients, 7 had thymomas and 29 had various degrees of involution and the formation of germinal centers in the thymic tissue. Thymomas in general are benign tumors, but they may expand locally, and implants at the time of operation are possible. The significance of the formation of germinal centers is not clear; however, the finding of a large number of germinal centers is highly suggestive of myasthenia gravis. ROBERT E. FLORER, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Cystic Pneumatosis of the Mesentery in Strangulated Hernia (Pneumatosi cistica del mesentere in ernia strozzata). AGOSTINO SCHISANO. *Riforma med.*, 1949, 63: 1075.

Cystic formations of the mesentery are rare, and gaseous contents of such cysts are extremely unusual.

In a man of 57 years with a strangulated inguinoscrotal hernia, operation revealed a cyanotic loop of the small intestine and a cyst, the size of a large orange, occupying the corresponding mesentery. After release of the strangulation, the intestinal loop revived. The cyst, containing gas, was excised. As the peritoneal cavity was not explored, it was impossible to determine whether more cysts were present in the mesentery.

The contents of mesenteric cysts may consist of lymph, mucus, blood, milky fluid (chyle), or gas. The cysts may represent either neoplasms or congenital malformations. The majority of workers attribute pneumatosis of the mesentery to chronic obliterating lymphangitis which may follow intestinal obstruction, tuberculous peritonitis, gastric ulcer, volvulus, or chronic gastroenteritis. Probably, gas-forming bacteria develop gas in the stagnant fluid. Gas may also enter a cyst from the intestinal lumen through a damaged wall.

Cysts may form within the intestinal wall, in the omentum magnum, in the gastrohepatic ligament, in the parietal peritoneum, and in the mesentery.

JOSEPH K. NARAT, M.D.

GASTROINTESTINAL TRACT

Secretory Studies on the Isolated Stomach. LESTER R. DRAGSTEDT, EDWARD R. WOODWARD, WILLIAM B. NEAL, JR., PAUL V. HARPER, JR., and EDWARD H. STORER. *Arch. Surg.*, 1950, 60: 1.

Studies were carried out on the total isolation of the stomach in dogs, with preservation of its blood and vagus nerve supply. These isolated stomachs secreted a maximum average of 906 c.c. of gastric juice in 24 hours when the continuity of the alimentary tract had been reconstructed. Where the fundus alone was isolated and the esophagus was united to the gastric antrum, a maximum average of 1,687 c.c. of gastric juice was obtained in one day. With the continued secretion and the loss of these large amounts of gastric juices, the process progresses on to hypochloremia, alkalosis, dehydration, azotemia, and death. When the salt intake was limited to that in the diet, these pathologic changes could be prevented, and the life of the dog prolonged by the use of the intravenous injection of isotonic sodium chloride solution, or 10 to 15 gm. of sodium chloride added to the diet every day. This pathologic process results promptly every time that the salt intake is cut off. Even the volume of gastric juice is reduced when the salt is withheld. The volume of gastric secretion can be increased by the proper administration of sodium chloride and, if fasting, has but little effect on the total secretion when adequate salt is administered. Typical peptic ulcers developed in this type of isolated stomach and caused death from hemorrrhage or perforation

RICHARD J. BENNETT, JR., M.D.

Treatment of Acute, Massive Gastroduodenal Hemorrhage. CLAUDE E. WELCH. *J. Am. M. Ass.*, 1949, 141: 1113.

In the present article, the criteria for the selection of patients with massive hemorrhage included the occurrence of acute hemorrhage accompanied by variable signs of shock, and the loss of approximately 50 per cent of the red cells. These criteria are somewhat more rigorous than those described in previous reports. By these standards the mortality at the Massachusetts General Hospital, Boston, from massive hemorrhage due to ulcer was 13 per cent in the 10 year period from 1938 to 1947.

The author believes it is clear that certain patients cannot be saved except by surgical means; hence, the problem narrows down to determining the indications for surgical intervention. Two methods immediately present themselves: either the indiscriminate surgical treatment of all patients with massive hemorrhage, or the selection of definite groups of patients who are to be treated medically or surgically. In order to delineate the indications for surgical treatment the author summarizes the prognostic factors attending hemorrhage from gastric and duodenal ulcer. These include: (1) location of the ulcer, (2) age of the patient, (3) the delay from onset to surgical intervention, (4) recurrent bleeding while the patient is under observation, (5) sex of the patient, (6) number of previous hemorrhages, (7) rate of bleeding, (8) type of bleeding as manifested by melena and hematemesis, and (9) complicating diseases.

The logical method of treating patients who enter with massive gastrointestinal hemorrhage comprises rapid diagnosis, adequate blood replacement, and surgical intervention in a selected group of patients with ulcer.

The author believes that early roentgenologic examination is advisable in all questionable cases. The examination can be performed without danger to the patient if small amounts of barium sulfate are used and there is no palpation. In this group a positive roentgenologic diagnosis of ulcer was made within 48 hours of admission to the hospital in 85 per cent of the cases in which it was used.

Patients in whom the positive or presumptive diagnosis is ulcer are admitted to the surgical wards for observation and therapy. Hematocrit or photohemoglobin determinations furnish the most im-

portant guide to therapy although the prothrombin time, blood volume, and determinations of nonprotein nitrogen, serum protein, and chlorides are of importance. Urinalysis is performed and an accurate intake and output chart is maintained, preferably aided by an inlying catheter. An inlying Levine tube is employed and the patient is placed on suction and irrigated to remove blood clot and hydrochloric acid. Half-hour determinations of the blood pressure and pulse rate are made. Vitamin K is administered, penicillin therapy started, and blood replacement begun as soon as possible. Use of morphine is contraindicated and phenobarbital sodium is given if necessary. Thrombin instillations have not been used in many patients, but when it was tried no value from use of this agent was noted.

Under these conditions, if bleeding is still continuing after the administration of 2,500 c.c. of blood, operative intervention should be performed at once. This group of patients will nearly all be over 50 years of age and the group will be comparatively small.

Stabilization will nearly always occur with two to three transfusions. Administration of blood is then continued slowly and intermittently with the expectation of maintaining the systolic blood pressure at a level of at least 100 and the hematocrit at 10 gm. Of this group, approximately one-quarter will bleed again at some time during their stay of 3 days in the surgical ward; if this occurs, immediate operation should be performed regardless of the age of the patient.

The remaining patients are then transferred to the medical service for further therapy. Nearly all of them can be built up rapidly and considered as candidates for interval resection. Interval resection gives a very low mortality. Only one patient in this group has returned to the hospital with bleeding after resection for massive bleeding.

Twenty-five per cent of medically treated patients not subjected to interval resections have returned at a later date with hemorrhage. Nine per cent have had a second episode of massive hemorrhage and 3 per cent have died from it. Interval operation is therefore usually advised and is performed as soon as possible in patients with gastric ulcer, and approximately 6 weeks after the hemorrhage in those with duodenal ulcer. The reason for the earlier attack on gastric ulcers is dictated by the easier technical problems and by the frequent confusion of this lesion with cancer.

The over-all mortality in 258 cases was 13 per cent. The surgical mortality was 8 per cent, and that of the patients who did not undergo operation, 15 per cent. The two methods of treatment, medical and surgical, should be considered to be complementary rather than conflicting.

The surgical mortality depends upon the stage of bleeding. When resection was performed within 48 hours of onset of bleeding, or on the first recurrence after that period, the mortality was 10 per cent in 32 cases. When it was done as a last resort after numerous recurrent hemorrhages, the mortality was 54 per cent. Resection carried out as an interval operation carried a mortality of 2 per cent.

The surgical complications are due chiefly to lack of hemostasis, care of the duodenal stump, and the depleted state of the patient. It is remarkable how frequently bleeding will be found to have stopped at the time of operation, and it does not recur after exclusion procedures; but if the hemorrhage has been rapid or severe, or is continuing at the time of operation, it is incumbent on the surgeon to ligate the gastroduodenal artery and its two terminal trunks, the right gastroepiploic and the superior pancreaticoduodenal vessels. This was necessary in about 10 per cent of cases in this series. If it is not done recurrent hemorrhage must be expected in a few cases. In this series there were three recurrent massive hemorrhages, and one associated perforation of a duodenal ulcer after exclusion operation. If this occurs, a second operation with ligation of the vessels is mandatory.

Cases in which there is difficulty in closing the duodenal stump have caused the author to actually leave a catheter sutured by means of a pursestring in the duodenal stump. The aspirated duodenal contents are returned to the intestinal tract by means of a jejunostomy catheter. The tube is removed in about 2 weeks and the fistula closes rapidly.

Inanition due to the long period of depletion has made pneumonia, peritonitis, and delayed healing of wounds frequent concomitants of late operations for hemorrhage. These can be obviated, at least in part, by adequate blood and vitamin replacement, penicillin therapy that is initiated before the pulmonary complications have occurred, and by jejunostomies for feeding purposes. HAROLD LAUFMAN, M.D.

Disturbances of Canalization and Occlusive Syndromes of the Gastric Stump after Resection (Disturbi della canalizzazione e sindromi occlusive del moncone gastrico dopo resezione). ANTONIO LANZARA. *Policlinico, sez. chir.*, 1949, 56: 221.

During the past 30 months a close postoperative check has been kept on patients who have undergone gastric resection. On the 154 patients, 114 resections were performed for duodenal ulcer or combined gastric and duodenal ulcer, 18 were done for gastric ulcer, 20 for postoperative gastrojejunal ulcer, and 2 for chronic occlusion, the last 2 patients having been subjected to resection elsewhere some months before.

Of these 154 patients, 3 (about 2%) are dead because of bronchopneumonia. Of the 151 survivors, 35 showed a slight retention following the operation, which did not exceed from 200 to 300 c.c., and the stomach tube was used only once. In 9 there was a postoperative retention which Bruusgaard would classify as "light"; there were not more than 600 c.c. that were retained in the gastric stump and the retention did not last longer than 3 or 4 days. Five patients had "moderate retention" as defined by the Scandinavian gastrologist, and only 1 patient of the entire 154 required a second intervention.

The results stated are, of course, remarkable when compared with the entire material in the author's experience at Florence and at Rome during the period from January 1, 1943 to May 30, 1949. This entire material (about 2,000 resections) included 16 reinterventions, 11 for acute retention and 5 for the chronic occlusion syndrome. Of the 11 cases of acute retention, 5 were the result of inflammatory stenosis of the anastomotic embouchure and 3 of internal hernia with incarceration of the jejunal loop, while 2 were probably instances of edema of the gastrojejunostomy opening with a concomitant functional factor. In the remaining patient the cause of the occlusion was not discovered (simple Witzel jejunostomy).

Of the 5 patients with inflammatory stenosis, 4 died. Of the 3 with incarcerated internal hernia, all died. The 2 patients with probable edema of the ostomy opening recovered. This, in the author's opinion, shows the necessity for even earlier intervention in the acute cases.

In the group with chronic retention in the gastric stump, the cause was found to be mechanical disturbances of position in 2 patients, cicatricial stenosis of the neostomy in 1 patient, adhesion to the surrounding structures in 1, and a combination of mechanical hindrance to emptying and adhesions in the last patient, the mechanical disturbance being caused by an abnormal elevation of the stomach and the adhesions producing a fixation of the organ in an unfavorable posture. In this group there were no deaths.

The good results recorded for the last 30 months are ascribed to prophylactic measures rather than the correction of technique, although, of course, this has helped some. In Rome Valdoni and his coworkers are now using only the anterior type of gastrojejunal anastomosis. However, Lanzara is of the opinion that with care and study on the part of the surgeon, good results can be attained with gastric resection whatever the method employed.

The prophylactic measures recommended are roughly as follows: the employment of a technique calculated to avoid the mechanical difficulties of gastric emptying, and avoidance of all superfluous operative trauma in order to reduce postoperative disturbances of function (ileus of the gastric stump) to a minimum. After the operation a systematic schema of gastric aspiration should be followed in order to shield the area of the anastomosis from the threat of infection or irritative inflammation arising from the decomposition of stagnating stomach contents. JOHN W. BRENNAN, M.D.

The Surgical Treatment of Cardiospasm (Zur chirurgischen Behandlung des Kardiospasmus). HANS FINSTERER. *Wien. med. Wschr.*, 1950, 100: 31.

The treatment of cardiospasm should be essentially medical, but surgical therapy came under consideration after 21 medical failures occurred. The surgical therapy consisted of the following procedures:

In the presence of peptic ulceration a gastric resection was performed, and in the 6 cases in which this was attempted by the author there were 3 fatalities. Further therapy may consist of a gastrostomy through which the cardiac end of the stomach may be stretched either by the fingers or by a rubber-coated intestinal clamp. When muscular hypertrophy is present in the cardiac region, it is permissible to cut the muscle fibers completely until the underlying mucosa is reached, after which "periesophageal" connective tissue is sutured over the exposed mucus membrane to prevent the formation of a pseudodiverticulum of the mucosa.

In addition, the most radical method of surgical therapy would be an esophagogastrostomy, which the author has done in 4 cases through an abdominal approach. SAMUEL J. FOGELSON, M.D.

Brain Disease and Stomach Ulcer (Gehirnerkrankung und Magengeschwuer). M. STAEMMLER. *Deut. med. Wschr.*, 1949, 74: 1485.

Six photomicrographs are offered to illustrate typical histologic lesions complicating various forms of cerebral pathology.

The first figure shows the gastric mucosal findings in a 33 year old male who died of meningitis, following an operation on a multiform glioblastoma. Here there is seen a localized hemorrhagic infarction of the mucosa, accompanied by intense congestion of the capillaries and small veins. Despite the fact that the mucous glands have undergone necrotic changes, the form of the tissue is still intact with no evidence (hematin) of digestion by the hydrochloric acid of the gastric contents.

The second specimen was procured from the stomach of a newborn infant. In this instance there is no hemorrhagic infarction as in the previous case, but only areas of bleeding into the tops of the plicae. These hemorrhages distended the plicae in places into drumsticklike formations. The author thinks that such a lesion as this might, just as in the first case, induce a weakening of the gastric mucosae from the digestive activities of the gastric succus and might account for the frequent reports of occult bleeding, or actual melaena, in the newborn child a few days after birth.

A third figure is a step further advanced in the series of gastric lesions of central origin leading to complete healing, or to the development of a chronic lesion. Here there is visible a small, sharply delineated ulcer, extending down to the muscularis mucosae. The floor is made up of edematous tissues permeated with leucocytes. The specimen originated in a child who died 36 hours after birth.

A fourth figure purports to show the condition of infarction of the gastric mucosa in a boy of 6 years, who died of encephalitis. The lesion is permeated with granules of hematin and shows other evidences of beginning gastric digestion. The deeper tissues are edematous and permeated by leucocytes. This lesion would perhaps eventuate as an ulcer resembling that shown in the third illustration.

A fifth figure shows a process which has advanced still further in the direction of chronic ulcer. This specimen was procured from the gastric mucosa of a 49 year old male with severe pachymeningitis hemorrhagica interna who died following a trepanation. Here the tissues are apparently entirely digested away. The floor of the ulcer is clean and the inflammatory process is evidently in regression. However, here also there is evidence of healing; the edges of the ulcer are apparently growing in over the defect.

The sixth figure shows the lesion in a 40 year old male with a bad break of the skull which resulted in bleeding into the ventricles. The surface of the gastric mucosae is widely indented with bean-sized indentations, exhibiting raised, ringlike borders. In the center of the lesion a necrotic process is visible. There is degeneration of the mucosal tissues but no evidence of a hemorrhagic infarct. The author regards this lesion as an anemic infarct, resulting from vascular spasm of central origin.

The author admits that in none of these cases is there any proof that these lesions would go on to form chronic ulcers; however, he believes that they show that there is a type of acute gastric ulcer produced by injury or disease of the central nervous system.

However, the very fact that most chronic peptic ulcers are found along the lesser curvature, near the pylorus, suggests that most of the lesions here described heal without a trace. Therefore, if they do at times go on to form the true chronic peptic ulcer of the stomach, there must be some other etiologic factor at work.

In any case, the author believes that he has shown that these lesions have a cause different from the direct peptic digestive ulcerations of Buecher and the ulcers of inflammatory origin of Konjetzny.

JOHN W. BRENNAN, M.D.

Peptic Ulcer Cases Reviewed After 10 Years. LAURENCE MARTIN and NINIAN LEWIS. *Lancet*, Lond., 1949, 2: 1115.

The authors review the case histories of all patients with proved peptic ulcers who were admitted to the medical and surgical wards of Addenbrooke's Hospital (Cambridge, England) during the 5 years from 1934 to 1938 inclusive. There is thus a minimum follow-up period of 10 years. The majority of the patients received some form of medical therapy although a significant number were treated surgically. The criteria adopted for the inclusion of a case in the series were the unequivocal roentgenological demonstration of an ulcer crater or its verification at operation or at autopsy. Doubtful cases were therefore completely excluded.

A total of 195 patients were interviewed and examined directly by means of a postal questionnaire. It was not necessary to submit all patients who attended the hospital to a barium meal examination, but this was carried out on all patients exhibiting questionable activity and on many whose ulcers were active, and therefore in need of treatment. Those who were clinically inactive were not examined roentgenologically so that the assessment of activity was essentially a clinical one. A history of characteristic ulcer dyspepsia during the 5 years before follow-up was held to constitute activity and, conversely, the absence of such symptoms was accepted as proof that the ulceration was quiescent.

Medical treatment gave successful results in only 44 per cent of 96 gastric ulcers, and in 32.5 per cent of 42 duodenal ulcers at a study after 10 years, hence there is the general conclusion that the medical therapy of peptic ulcers is not likely to be successful in more than 50 per cent of the patients treated. It cannot be denied that medical therapy relieves the discomfort of most relapses; however, from the evidence presented in such a long term follow-up study, it appears that medical therapy does not afford any adequate protection against further trouble if this is destined by the ulcer.

Because of their clinical experience in caring for patients with chronic peptic ulcer, the authors advocate more liberal utilization of gastrectomy, not only more often, but also earlier in the treatment of the chronic lesions. After 10 years' duration, the peptic ulcer should be regarded as chronic. About 55 per cent of all hemorrhages and 45 per cent of perforations in this series occurred in patients having a history of 10 years' or more activity, and these included 7 deaths from bleeding and 16 from perforation. Although each patient must be evaluated completely on individual circumstances, it is suggested that subtotal gastrectomy be performed in patients having peptic ulcers of 10 years' duration.

ORVILLE F. GRIMES, M.D.

The Effect of Vagotomy on the Gastric Secretion in Man and Experimental Animals. EDWARD R. WOODWARD, PAUL V. HARPER JR., E. BRUCE TOVEE, and LESTER R. DRAGSTEDT. *Arch. Surg.*, 1949, 59: 1191.

A continuous secretion of gastric juice occurs in normal persons even when the upper part of the alimentary tract is empty of food and the subject is asleep or shielded from the sight, smell, or taste of food. Under these conditions, an average of 18 milli-equivalents of hydrochloric acid is secreted during a 12 hour period at night. Under the same conditions, 135 patients with duodenal ulcer secreted an average of 60 milli-equivalents of hydrochloric acid, or almost 4 times as much as the normal level.

The output of hydrochloric acid in patients with duodenal ulcer is reduced to an amount below the normal level by complete vagotomy, which indicates that the hypersecretion in these patients is neurogenic in origin and that the continuous secretion in normal man is partly due to a secretory tonus in the vagus nerves.

A determination of the amount of hydrochloric acid secreted by the empty stomach of patients with ulcer, in a given period, is the most important index of the secretory abnormality in these patients, the best guide in evaluating the completeness of vago-

tomy, and the most useful measurement in subsequent management.

An increase in gastric secretion in response to insulin hypoglycemia constitutes definite evidence that functional secretory fibers to the stomach are present. Failure to secure a response in normal persons is occasionally seen, and not infrequently in the immediate postoperative period, even when vagotomy has been incomplete. Repeated tests at subsequent periods elicit positive responses in these persons. Repeated negative response to insulin hypoglycemia is good evidence that vagotomy has been complete, and a reduction in acid output greater than 60 per cent is usually found.

An increase in gastric secretion in response to a sham meal indicates that functional secretory nerves in the vagi are present, but a single negative response is of less value as a criterion of complete vagotomy than is a negative response to insulin hypoglycemia.

In dogs with vagally innervated, totally isolated stomachs, complete vagotomy reduces the output of hydrochloric acid by an average of 76 per cent. Since the nervous and intestinal phases of gastric secretion alone are operative in these animals, it is evident that the nervous phase is more important than the intestinal phase, in the ratio of 3 to 1.

Section of one vagus nerve in the neck has no effect on the volume or acidity of the secretion in dogs with vagally innervated, isolated stomachs.

SAMUEL KAHN, M.D.

Gastrectomy for Ulcer and Cancer of the Gastric Stump (Gastrectomie pour ulcus et cancer du moignon gastrique). CH. DEBRAY, M. ROUX, R. CHEVILLOTTE, and S. SÉGAL. *Union méd. Canada*, 1950, 79: 6.

Six cases are reported in which carcinoma developed several years after gastrectomy was performed for gastric or duodenal ulcer. In each case the diagnosis of ulcer was established histologically and, inasmuch as there was no evidence of malignancy, the subsequent appearance of cancer could not be considered a recurrence.

The authors call attention to diagnostic difficulties in such cases because the malignant condition may be overlooked while the physician's attention is being focused on the anastomosis itself.

The question arises whether the stump remaining after partial gastrectomy does not create conditions favorable to the development of cancer.

In 2 cases the tumor was removed with great difficulties; in 1 case the excision was relatively easy; in 2 cases excision was impossible and in 1 case it was not attempted. The poor results were due to the fact that the symptomatology of malignancies in the cardiac end of the stomach is very limited, the condition remains latent for a long period of time, and dysphagia appears only after the tumor has attained a large size. The location of the tumor also creates difficulties for the roentgenologist and gastroscopist.

The authors advocate the abdominal route for extirpation, which may be supplemented by the transthoracic approach if necessary. They recommend the Roux type of esophagojejunostomy. The vascularization of the jejunum around the stoma is better preserved when a lateral anastomosis is done, and the Roux branch can easily be attached to adjoining organs such as the diaphragm.

JOSEPH K. NARAT, M.D.

Malrotation of the Bowel Causing Intestinal Obstruction. WILLIS J. POTTS and L. MARTIN HARDY. *Q. Bull. Northwest. Univ. M. School*, 1950, 24: 42.

Congenital malrotation of the bowel is of no consequence until, because of it, specific types of intestinal obstruction occur. All sorts of abnormalities may be seen. Failure of the bowel to return to the abdomen during the embryonic stage of rotation when the midgut is forced into the umbilical cord will result in exomphalos. The bowel may return to the abdomen but fail to rotate, which leads to volvulus. Reversed rotation of the bowel causes the transverse colon to lie behind the duodenum and superior mesenteric artery, at which point obstruction is apt to occur. However, the most important pathologic condition is the abnormal band of peritoneum which frequently overlies the duodenum. This band extends from some portion of the right half of the colon across the duodenum to the posterior abdominal wall and causes duodenal obstruction.

Acute cases manifest themselves clinically in the early weeks of neonatal life. Vomiting of greenish material, dehydration, and the passage of small stools are the outstanding symptoms. An upright roentgenogram will show a greatly dilated stomach and duodenum, and with contrast media the point of obstruction can be located readily. Chronic or periodic obstruction due to malrotation is seen in older infants and usually follows a history of intermittent vomiting, "stomach ache," and cramps. Confirming barium studies may show an obstruction of the duodenum or an abnormally placed cecum.

Treatment is surgical. Preoperatively the stomach should be emptied, and hydration and the electrolyte balance should be re-established. A long paramedian incision should be made to permit adequate inspection. Two basic conditions are usually found. In the first the cecum lies in the midline or in the upper right quadrant and a band of peritoneum may be found lying taut across the duodenum. Section of this band will release the obstruction and the cecum will fall into a functioning position. The second condition is the more serious type; in this there is volvulus and malrotation of the bowel which require delivery of all the bowel from the abdomen in order to obtain a quick knowledge of the pathologic condition. The volvulus is untwisted in a counterclockwise direction. Again, the peritoneal bands over the region of the duodenum holding the cecum and ascending colon in the right upper quadrant must be cut.

Two case reports (from the Children's Memorial Hospital in Chicago) of obstruction due to malrotation are reported. One patient was a 7 day old in-

fant with acute obstruction in which surgical removal of the broad band of adhesions from the ascending colon across the duodenum resulted in an uneventful recovery. The other patient was a 6 year old child with chronic intermittent obstruction who was explored and found to have a 180 degree rotation of the small bowel with a strong adhesive band extending from the middle of the ascending colon over the first part of the jejunum to the root of the mesentery. Recovery followed release of this adhesion.

Malrotation of the intestines may not produce difficulty for many years. It is pointed out that in adults, obstruction of the duodenum by congenital bands may produce symptoms resembling ulcers or may be associated with evident ulcers. Three case histories are submitted to support this contention.

CURTIS ARTZ, M.D.

Identification of the Toxin of Clostridium Organisms in Experimental Intestinal Obstruction. RAYMOND E. ANDERSON and CARLOS A. TANTURI. *Arch. Surg.*, 1950, 60: 143.

The present study was undertaken in an effort to identify the clostridium toxin from the lumen of strangulated small intestine in the dog. Commercially prepared polyvalent gas gangrene antitoxin does not inhibit the enzymatic action of clostridium toxin in the dog with the same specificity as does the serum obtained from convalescent experimental animals.

Two controls were set up for each analysis, and 20 animals were used. In 91.7 per cent of the animals lecithinase has been directly identified in the contents of the lumen of the obstructed strangulated small intestine. This toxin has also been identified in the abdominal exudate present with such an obstruction in 33.3 per cent of the cases when gross perforation of the obstructed segment has not occurred. Commercial polyvalent gas gangrene antitoxin was unable to inhibit the hydrolysis of the lecithin by the toxin of the clostridia found in the dog. The serum taken from the dogs that have recovered from gangrenous intraperitoneal lesions will prevent the hydrolysis of lecithin by the standard Clostridia welchi toxin.

RICHARD J. BENNETT, JR., M.D.

Hemorrhagic Infarct of the Small Intestine (O enfarte hemorrágico do intestino delgado). BENEDITO MONTENEGRO. *Ann. paul. med. cir.*, 1949, 58: 349.

Hemorrhagic infarct of the small intestine is infrequent since it was encountered in only 0.1 per cent of the autopsies performed in the Department of Pathologic Anatomy of the Faculty of Medicine of the University of São Paulo among a total of 10,002 patients admitted to the hospital. It is usually caused by occlusion of a mesenteric artery or vein, by embolus or thrombus in the case of an artery, and by a thrombus in the case of a vein. To these causes must be added the shock of intolerance, a probably allergic phenomenon described by Grégoire, which would give a satisfactory explanation of infarcts without apparent cause. The superior mesenteric artery and vein are most frequently involved.

If the occlusion occurs suddenly in the initial part of the upper mesenteric artery, the result is an anemic infarct of a large part of the intestine; but if the occlusion occurs slowly, a collateral circulation sufficient to maintain the life of the organ may result without the tragic occurrence of sudden occlusion. If the occlusion occurs in the branch of artery proximal to the last arch and it is gradual, there may be no symptoms; but if it is rapid, as is generally the case, there will be a concomitant spasm of the collateral circulation which results in an anemic infarct of the intestinal portion irrigated by the occluded artery. Under these circumstances, the initially anemic infarct subsequently becomes hemorrhagic as the spasm disappears and there is an afflux of blood into the infarcted zone. Occlusions distal to the last arch probably cause no symptoms in a certain number of cases and only temporary symptoms in other cases.

When the occlusion occurs in the veins, there is a constant afflux of blood from the arteries to the infarcted area so that the resulting lesion is always of a hemorrhagic nature. Thus, despite the difference in the mechanism of production of the infarcts due to occlusion of arteries or of veins, the final result is always the same—a hemorrhagic infarct. The occlusion of mesenteric veins may also be gradual, and the clinical picture may be as acute as in the case of arterial occlusion.

The diagnosis of intestinal infarct can be made in many cases presenting an acute abdominal picture, if the following points are noted: (1) a clinical history revealing some of the predisposing causes; (2) characteristics of the onset of the clinical picture corresponding generally to two types: sudden transformation of an advanced cardiovascular disorder into an acute condition of the abdomen, or a gradual change of a mild colic, with or without diarrhea, into a partial obstruction and, finally, strangulation; (3) early disappearance of peristalsis in a case in which intestinal obstruction seems to be the most probable cause of the acute condition of the abdomen; (4) appearance of marked leucocytosis in a case with the above-mentioned characteristics before the development of peritonitis; (5) bloody feces or blood in the rectum without local cause; and (6) dilatation of the ileum and the right half of the colon reaching close to the splenic angle, verified by roentgen examination, and the presence of intraperitoneal fluid, also verified by roentgen examination.

In accord with the site and the speed of the occlusion, the conditions range from the fulminating to the chronic, and some patients even recover. Patients that come to surgery are always in the worst condition, and the mortality statistics range from 75 to 98 per cent, 60 per cent of the fatalities occurring during the first week of the disease and the other 40 per cent within 1 or 3 weeks.

Treatment may be medical or surgical, medical in cases with mild symptoms and surgical in those with rapid evolution and alarming signs. The medical treatment aims at correcting the causes predisposing the subject to infarction: liver cirrhosis and cardiac disturbances. Surgical treatment may consist of simple laparotomy with the injection of adrenalin into the involved artery or its branches; if the intestine reacts favorably, the abdomen may be closed and the patient will recover, but if the intestine does not react its resection is imperative and the extent of the resection will depend on the extent of the infarct. The method of anastomosis will depend on the choice of the surgeon. Interventions on the sympathetic system have not given the results expected from them. RICHARD KEMEL, M.D.

Solitary Hemangioma of the Small Intestine. Abstract of Literature and Report of a Case. CHESTER C. GUY and HARRY F. COOPER. *Surgery*, 1950, 27: 293.

The authors state that hemangiomas of the intestinal tract are comparatively rare and are seldom diagnosed correctly except at operation or at autopsy. Various pathologic classifications have been made of hemangiomas of the gastrointestinal tract. Kaijser divides hemangiomas into four types and considers them all to be congenital in origin.

Histologically, hemangiomas are neoplasms made up of blood vessels which have arisen from remnants of fetal tissue that have been misplaced or disordered in development. Combinations of solid tumor cell masses and open vessels occur.

A review of case reports indicates that melena, anemia, and weakness are the outstanding symptoms. Abdominal pains simulating appendicitis are sometimes encountered, and appendectomy is performed. Cramping abdominal pains and audible intestinal gurgling indicate partial obstruction and are common complaints. Vomiting and an abdominal mass may occur if there is obstruction. In several reported cases of gastrointestinal hemangioma there were also hemangiomas of the skin.

Unexplained melena after proper study warrants exploration, as undue delay may result in a fatal outcome from hemorrhage. Frequently, an aid in locating the lesion is a pulsating artery leading into the mass. Resection is the treatment of choice. If widespread distribution of multiple lesions contraindicates resection, irradiation can be tried, noting at the time of laparotomy the areas of probable hemorrhage as an aid to the roentgenologist. Cauterization has been used in some cases, usually with only temporary relief.

The authors report in detail one case in which operation was successful. Exploration revealed a pulsating constricted area 3 inches long about one-third of the way down the small bowel. The proximal portion of this area was somewhat dilated as compared with the distal portion past the central constriction. The whole area was hyperemic, purple-red, with numerous fine serosal capillaries, and in the mesentery were dilated veins forming a fan-shaped area extending from the root of the mesentery to the lesion. This portion of the mesentery as well as the segment of the intestine visibly pulsated synchronously with the aortic pulsations. There were small, firm lymph glands scattered throughout the mesentery of the small bowel. The spleen was enlarged and firm. The lesion was resected and an open method end-to-end anastomosis was done.

Microscopic sections of the removed specimen revealed the bowel wall altered by the presence of large numbers of various sized spaces filled with blood. These were most numerous in the muscular coats where they occupied up to one-half of the field. The smaller capillaries consisted only of a single layer of endothelial cells. Most of the larger ones had a similar wall, but occasionally an additional thin layer of fibrous tissue was seen surrounding the endothelial lining. Fine branching vessels could be seen extending between larger blood-filled cavities. Large vessels were prominent in the subserosa. The submucosal layer was strikingly free of capillaries as compared with the muscularis and the mucosa. In the latter, the vessels were smaller but extremely numerous and extended to the inner edge of the mucosa. Much of the mucosa had ulcerated and was represented by very loose areolar tissue showing a marked inflammatory cell reaction. Plasma cells, eosinophiles, lymphocytes, and leucocytes were seen infiltrating all layers of the bowel wall. The latter were most numerous in the mucosal layers where ulcerations covered by a pyogenic membrane and small masses of necrotic tissue obliterated the normal architecture.

The patient made an uneventful recovery and was discharged 10 days following operation with no abdominal cramps; he was eating well. In a communication some 2 years later, he stated that he was entirely free of abdominal complaints, was gaining weight, and had returned to work as a chauffeur.

ROBERT TURELL, M.D.

Studies in Ulcerative Colitis. The Personality in Relation to Ulcerative Colitis. V. P. MAHONEY, H. L. BOCKUS, MARGARET INGRAM, J. W. HUNDLEY, and J. C. YASKIN. *Gastroenterology*, 1949, 13: 547.

The role of psychological factors in the etiology and course of ulcerative colitis has been frequently mentioned and is quite generally accepted. It has been infrequently supported by psychological study. Twenty cases of chronic, nonspecific or idiopathic ulcerative colitis with irrefutable symptoms and findings were submitted to tests to determine whether these patients had consistent specific personality traits.

Two methods of study were used. The patient and, if possible, members of the family were submitted to (1) psychiatric interviews and histories, and (2) the Rorschach test. The findings in the latter, a more objective test, were compared with the results of the psychiatric interviews. This test consists of examination, by the patient, of 10 cards, on

each of which is a standard inkblot with two symmetrical halves. The test is a projective test in which the patient is asked to state what he sees in the relatively formless blot, what it looks like, what it makes him think of, or suggests to him. By creating meaningful forms out of meaningless material he reveals fundamental traits in his character. The responses are evaluated and scored.

These personality studies did not disclose the reason for the localization of the pathophysiological process in the colon, nor were any of the personality traits found in ulcerative colitis, when taken alone, specific for this disease. However, the more objective findings of the Rorschach test corroborated the results of the personality interviews rather closely and it was quite evident that every patient had definite neurotic traits.

The following traits were revealed by the method of psychiatric interview: tension, inability to assert self, anxiety, and sensitivity were found in all; hostility and immaturity in 19 cases; guilt and indecision in 18; passivity in 16; dependency and conscientiousness in 15; aggression and perfectionism in 12; anestheticism in 6; and rigidity in 1 case.

The Rorschach test, which was performed in 19 of the 20 patients, revealed the following: inability to respond to stimulation in their environment, in 19 cases; immaturity and anxiety in 18; guilt, lack of flexibility in thinking, and lack of ambition in 17; indecision and hostility in 13; excessive phantasy life in 11; aggression and passivity in 9; perfectionism in 12; psychotic trends in 1 case.

A study of the early developmental factors revealed considerable emotional illness in the family, major disturbances in the parent-child and sibling relationship, and numerous early traumatic experiences not specifically related to the intestinal tract.

FREDERICK C. HOEBEL, M.D.

The Blood Supply to the Sigmoid Colon and Rectum. The Technique of Rectal Resection with Restoration of Continuity. J. C. GOLIGHER. *Brit. J. Surg.*, 1949, 37: 157.

The author stated that in the performance of sphincter-saving resections of the rectum with restoration of continuity, a major concern of the surgeon is to secure an adequate blood supply to the portions of colon and rectum remaining for anastomosis. An accurate knowledge of the anatomy and functional capabilities of the vessels supplying the distal colon and rectum is essential. There is still need for greater clarity on the feasibility of combining high ligation of the inferior mesenteric vessels with subsequent re-establishment of the intestinal continuity. In this article the anatomy of the arterial supply to the sigmoid colon and rectum has been reinvestigated in cadavers and in patients at operation with special reference to this question.

The distribution of the inferior mesenteric artery was examined post mortem in 75 adults. It was noted that the first sigmoid and left colic branches arose conjointly in 40 of the 75 specimens, and that their common origin lay opposite the bifurcation of the abdominal aorta. In 5 specimens, indeed, the second sigmoid also arose with the left colic artery, this disposition being most frequently observed when there were 5 or 6 sigmoid branches instead of the usual 3 or 4. In the remaining 30 specimens the vascular pattern corresponded more closely to the standard anatomy textbook description, the left colic and first sigmoid arteries being separated at their origin by a gap of ½ to ¾ inch.

Because of the great predilection of carcinoma of the rectum to spread upward along the lymphatics accompanying the superior hemorrhoidal and inferior mesenteric vessels, it is important in a radical operation for this disease that these vessels be tied as high as possible. In the classical combined abdominoperineal excision most surgeons follow the advice of Miles and apply the main ligature roughly opposite the bifurcation of the abdominal aorta. This will place it just below the conjoined origin of the first sigmoid and left colic arteries, or, if these two vessels arise separately, possibly between them. If resection operations are to compete with combined excision, it is essential that in them, also, ligation should be carried out at this point and no lower, and rather than compromise on this issue, the attempt at resection should be abandoned in favor of a combined excision.

The author's arterial preparations demonstrate that ligation of the inferior mesenteric vessels may be accomplished exactly as in a combined excision and yet sufficient sigmoid colon be preserved for re-establishing continuity. This can be done by three methods:

Method 1. In the average case with a reasonable length of sigmoid colon, the most dependent point of the loop is supplied by the first sigmoid artery, so that by tying the inferior mesenteric vessels just below the origin of this branch and dividing the mesocolon parallel to it, a sigmoid stump is obtained with a direct blood supply to its tip which can extend practically to the peritoneal reflection, and will therefore usually suffice for anastomosis after resection down to this level. For some, at an even lower level it will also be adequate because when the rectum is mobilized so that it assumes a straight course upward from the anus instead of lying in the concavity of the sacrum, the level of the peritoneal reflection may rise as much as 2 inches. If a longer sigmoid stump is required it may be secured by either of the succeeding two methods.

Method 2. In this method the inferior mesenteric artery and mesocolon are divided as in Method 1, but, instead of sectioning the bowel, the bowel and the intersigmoid arcades for some distance below this are preserved intact. The length obtained by this maneuver depends on the width of the gaps between the sigmoid arteries, which is actually very variable, but generally from 2 to 3 inches of lengthening can be accomplished in this way.

Method 3. After ligation of the inferior mesenteric vessels just below the common origin of the first

sigmoid and left colic arteries, the first sigmoid artery itself is divided close to its commencement (or in the cases where it and the left colic arteries arise independently, the main inferior mesenteric ligature is applied between these two branches). Thus reliance is placed entirely on the descending branch of the left colic artery, and the marginal artery between it and the first sigmoid artery, for the supply of the stump. This opening up of the large "window" between the first sigmoid and the left colic arteries usually secures an additional 2 to 3 inches of colon, and, further, permits of another inch or two being obtained, if necessary, by division of the peritoneum at the outer side of the descending colon and mobilization as far as the splenic flexure. Until the first sigmoid artery has been divided, freeing of the descending colon in this fashion is futile, because it is the factor determining the extent to which the end of the stump can be brought down in the intact first sigmoid.

Experimentation with the arterial specimens showed that however short the sigmoid loop might be, enough colon could always be provided by one of these maneuvers (most often method 3) to permit of end-to-end union with the anorectal remnant after resection had been done 1 inch or so below the anterior peritoneal reflection. By utilization of both methods 2 and 3 for lengthening of the sigmoid stump, it was found possible to obtain a sufficient quantity of bowel for pull-through operations in 41, or approximately 53 per cent, of the postmortem specimens; in the remainder the length of colon secured fell short of that required and in these cases abdominoanal anastomosis would have been impossible.

In 36 patients, sigmoid stumps were prepared by the three methods. In 17 cases the preparation of the colon was according to method 3, with reliance on the descending branch of the left colic artery. In 8 cases method 2 was used, the first sigmoid and the intersigmoid marginal arteries being preserved, and viable stumps were obtained in all. In 9 cases the sigmoid stump was prepared as in method 1, the first sigmoid artery supplying the end of it.

Finally, in 3 cases in which a particularly long piece of colon was required for an abdominoanal anastomosis, recourse was made to a combination of methods 2 and 3, the stump being supplied by the descending branch of the left colic artery, and beyond this by the intersigmoid marginal artery. The colon thus prepared seemed quite viable at operation, but after operation necrosis took place in 2 cases, in one involving fully 4 inches of bowel. However, the two patients survived the mishap. It would seem that these long stumps are particularly prone to thrombosis of their vessels, due either to the operative trauma or to later sepsis.

When the entire sigmoid colon has to be sacrificed as, for example, in certain cases of double carcinomas, it may be possible to resect up to the splenic flexure or the middle of the transverse colon, and anastomose the remainder of the transverse colon to the rectal stump. The technique consists of resecting up to the splenic flexure and then swinging down the left end of the transverse colon which is nourished by the long left branch of the middle colic artery. A third possibility is to utilize a loop of ileum, isolated except for its blood supply, as a graft to bridge the gap between the stump of iliac colon and the rectum.

The blood supply to the anorectal stump after resection, in which the superior and often the middle hemorrhoidal vessels have been divided, is surprisingly abundant. It would appear to be derived from not only the inferior hemorrhoidal arteries, but also numerous unnamed branches in the anterior parts of the levator muscles. ROBERT TURELL, M.D.

Complete Pelvic Evisceration in the Male for Complicated Carcinoma of the Rectum. The Use of a Defunctionalized, Sterilized Loop of Colon for Ureterosigmoid Anastomosis. JESSE E. THOMPSON and CHESTER W. HOWE. *N. England J. M.*, 1950, 242: 83.

A successful case of radical excision of pelvic viscera for complicated carcinoma of the rectum in a male patient is presented.

The principles of preliminary proximal colostomy and intestinal antisepsis by the instillation of properly selected antibiotic and chemotherapeutic agents are suggested as prophylactic measures against the postoperative complications of wound sepsis and urinary-fecal fistulas. BENJAMIN GOLDMAN, M.D.

The Anal Ducts and Their Clinical Significance. GUY L. KRATZER. *Am. J. Surg.*, 1950, 79: 32.

A demonstration of the possible role played by the anal ducts in the spread of anorectal infection is described.

In histological studies, the author demonstrated the presence of epithelial-lined ducts in about 50 per cent of human anal canals. From openings in the anal crypts the ducts course outwards, often penetrating the external sphincter. About 10 per cent of the specimens studied showed definite mucus producing cells. Many of these ducts showed periductal inflammatory reactions, especially in patients having anal cryptitis.

These ducts may provide pathways for the spread of infection, and it is conceivable that ischiorectal abscess may have such a pathogenesis.

Based upon this information, the author believes that pararectal abscesses should be adequately drained, and the crypt in the corresponding segment of anal canal should be removed.

ELY ELLIOTT LAZARUS, M.D.

Anorectal Malignant Melanoma. RONALD W. RAVEN. *Am. J. Surg.*, 1950, 79: 85.

Malignant melanoma is the most virulent of all known tumors. The melanoblast is the cell type of malignant melanoma, and while a considerable amount of melanin is present in some cells and less in others, its presence does not appear to affect the

malignant properties of the cells. The malignant melanoma has a high metastasizing potential, and metastases may appear almost simultaneously with the primary neoplasm which may remain very small. The property of producing widespread metastases is an outstanding feature of the disease, and the patient usually dies from generalized metastases.

The anorectal region is the commonest site in the alimentary canal for the occurrence of the lesion, but even here its presence is uncommon. The tumor arises in the skin of the anal canal or at the anal verge; the rectum may be invaded by direct extension. The tumor is single, sessile, or pedunculated. There is a marked tendency to spread from the anal canal to the rectum along the submucous tissues, and also laterally into the tissues around the rectum and anus. The ileoinguinal lymph nodes are frequently involved, and are usually black in color even though the primary growth is amelanotic. Invasion of the blood vessels leads to widespread metastases.

The end results in malignant melanoma of this region are unfavorable. When conditions are favorable, an abdominoperineal excision of the rectum, followed in 4 weeks by a bilateral ilioinguinal block dissection, should be performed. Irradiation is of no value. ELY ELLIOTT LAZARUS, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Surgery of the Biliary Tract; A 5 Year Study. JOSEPH GASTER. *Arch. Surg.*, 1950, 60: 21.

The author presents a study of 533 patients who underwent 550 operations on the biliary tract. Multiple operations were carried out on 17 patients. Seventy-six per cent of the patients were women and 24 per cent were men. The ratio of women to men was approximately 3 to 1; however, the relative incidence of jaundice was higher among men. Several tables are included showing the mortality rate in various operative procedures. The common duct was explored in 19 per cent of the cases, and of these, stones were found in 40 per cent. In 30 per cent of the cases, jaundice was due to stones. The mortality rate in the jaundiced group is more than three times as great as that in the nonjaundiced group. The mortality rate among patients over the age of 50 was almost ten times as great as among patients below the age of 50. Seventeen patients underwent operations for malignant lesions.

RICHARD J. BENNETT, M.D.

Acute Pancreatitis: A Clinical Study. VINTON E. SILER and JOHN H. WULSIN. *J. Am. M. Ass.*, 1950, 142: 78.

The clinical manifestations of acute pancreatitis have been studied in a group of 98 patients admitted to the Cincinnati General Hospital, Cincinnati, Ohio, during the years 1941 to 1948 inclusive. Since some patients were admitted more than once with the same diagnosis, a total of 111 admissions was available for analysis.

The diagnosis for each admission was based on (1) a clinical history along with an elevated serum amylase level, (2) surgical observations, and (3) postmortem examination. The clinicopathologic types given are: interstitial, hemorrhagic, suppurative, and unclassified. In 75 per cent of patients the condition was of the interstitial type; in 12 per cent, hemorrhagic; in 12 per cent, suppurative; and in 1 per cent, unclassified. By far the greatest number of patients were in the fourth decade of life. Approximately 20 per cent of patients had recurrent attacks of acute pancreatitis and 35 per cent had associated gall-bladder disease.

In the total series, 45 patients were operated upon with an operative mortality of 15.5 per cent. Postmortem studies were made on 17 patients. The operative mortality in 5 patients with hemorrhagic necrosis was 60 per cent. Emergency operations were not undertaken in the face of an established diagnosis of acute pancreatitis. The only procedure of definite help during the acute illness consisted of incision and drainage of secondary abscesses. Nonoperative treatment during the acute stage of the disease was conservative and consisted of bed rest, of withholding food and water, of intravenous replacement therapy, and sedation. The use of penicillin did not appear to diminish morbidity in any striking manner. RICHARD J. BENNETT, M.D.

Treatment of Chronic Pancreatitis by Unilateral Splanchnicectomy. PIERRE MALLET-GUY and MICHEL JAUBERT de BEAUJEU. *Arch. Surg.*, 1950, 60: 233.

The authors report 70 cases of splanchnicectomy for chronic relapsing pancreatitis. Vasomotor activity in the pancreas is controlled by the splanchnic nerves. The experimental creation of acute pancreatitis through electrical stimulation of the splanchnic nerve supports this and is also confirmed by the success achieved with splanchnic block. Experiments on animals have indicated that the right splanchnic nerve acts on the biliary ducts, and that the left splanchnic nerve acts on the pancreas. Splanchnicectomy affects vasomotor change which checks the development of inflammatory sclerosis or breaks the vicious reflex cycle which is responsible for acute and subacute recurrences.

The type of pancreatitis considered here is that which is related to the body of the pancreas or with severe lesions on the left. The author has obtained excellent results with splanchnicectomy in the treatment of 72 patients with hypotonus of the gall bladder or of the common bile duct. Patients with recurrent pancreatitis associated with biliary obstruction respond poorly to splanchnicectomy, whereas those with normal bile ducts or with hypertonia and frequent reflux respond well.

The author performs subdiaphragmatic splanchnicectomy at the same time as laparotomy. The procedure is carried out in the subperitoneal lumbar region and the great splanchnic nerve is excised for 3 cm. The sympathetic trunks are not dissected.

Improvement in patients is noted by the increase of weight, the disappearance of diarrhea, disappearance of digestive troubles, heaviness in the epigastrium and the left hypochondriac region, and loss of left abdominal and dorsolumbar pain. In the entire group of patients the common duct was normal or widely open. ROBERT E. FLORER, M.D.

Insuloma with Absence of Hypoglycemia. BENGT FRIES. *Acta chir. scand.*, 1949, 99: 225.

Tumors arising from the islands of Langerhans, and which are unassociated with increased insulin production are extremely rare. The author states that only 2 such cases are reported in the literature and he presents a third such case. The tumors are largely asymptomatic until their increasing bulk produces symptoms. Of the 3 recorded tumors, 1 was clearly benign, 1 was malignant, the patient dying of distant metastases, and in the case reported by the author the tumor was microscopically malignant but no metastases have occurred in over 3 years of follow up. F. J. LESEMANN, JR., M.D.

Two Successful Resections for Carcinoma of the Pancreas. HAROLD DODD. *Brit. M. J.*, 1949, 32: 1509.

Two cases of carcinoma of the pancreas in which a resection operation was carried out successfully are described.

The magnitude of this operation was increased by resection of the ascending colon and of the transverse colon, a procedure which seems not to have been called for hitherto, as no record of such a step has been found in the literature.

BENJAMIN GOLDMAN, M.D.

Ligation of the Splenic Artery, the Operation of Choice in Selected Cases of Portal Hypertension and Banti's Syndrome. ALEXANDER W. BLAIN and ALEXANDER BLAIN, III. *Ann. Surg.*, 1950, 131: 92.

Although admittedly a less radical and less effective procedure than the various porta-caval shunting operations, the authors advocate simple ligation of the splenic artery as the procedure of choice in selected cases of Banti's syndrome and portal hypertension. According to the authors, about 60 per cent of the portal blood flow comes from the superior mesenteric vein, and the remaining 40 per cent is contributed by the splenic vein. In cases of splenomegaly, it is believed that this latter figure is increased. Hence, they reason, splenic artery ligation should markedly reduce the portal hypertension. Further, it is argued, this operation should reduce portal hypertension more than splenectomy because the veins carrying blood around the portal bed block via the spleen and its vascular attachments are left intact, whereas in splenectomy they are removed. The operation is particularly of value in extremely poor risk patients who cannot tolerate more extensive procedures. As has been described by Linton and Hardy, splenic artery ligation may be indicated as a first stage procedure in a two-stage splenorenal anastomosis for poor risk patients with portal hypertension. However, shunting operations would be extremely difficult or impossible if a splenectomy had previously been performed.

In various splenopathies other than disease due to portal hypertension, splenic artery ligation may often be the operation of choice. With such states as idiopathic thrombocytopenic purpura in which the presence of accessory spleens may be an important factor in the patient's recovery, ligation of the splenic artery is apt not to be effective treatment. Rarely, an enlarged spleen is due to a primary splenic neoplasm; in such cases the lesion might go unrecognized if only the splenic artery is tied and the viscus left *in situ*.

Five cases are reported in the present series. Two patients underwent splenic artery ligation following a diagnosis of Banti's syndrome unassociated with obvious hepatic cirrhosis. Of these, one patient has survived and is reported to be well after an interval of 34 years. The second patient was well for 1 year after operation, but now presents jaundice and other symptoms due, possibly, to gallstones. Three patients had splenomegaly due presumably to portal hypertension subsequent to hepatic cirrhosis. One of these is well and without recurrence of ascites 2 years following ligation of the splenic artery. A second patient died 4 months after operation with recurrent ascites, and a third patient is well 10 months after operation. WAYNE F. CAMERON, M.D.

MISCELLANEOUS

Abdominal Trauma. A Clinical Study of 200 Consecutive Cases From the Massachusetts General Hospital. CLAUDE E. WELCH and W. PHILIP GIDDINGS. *Am. J. Surg.*, 1950, 79: 252.

A comparison is made between a series of 200 consecutive cases of abdominal trauma which were admitted to the Massachusetts General Hospital, Boston, and a formidable series of 3,154 abdominal injuries treated by the Second Auxiliary Surgical Group during the war. An attempt is made to ascertain wherein civilian and military experiences resemble or differ from one another and to determine what lessons of military surgery may profitably be applied in civilian practice.

This comparative study emphasizes several features: (1) the group of patients differs in several important respects from that observed in military practice, (2) operative mortality has declined significantly in recent years, and (3) the methods of treatment are applicable equally to both groups of cases.

War injuries are nearly exclusively wounds by penetration. Blunt or subcutaneous abdominal trauma is exceptionally unusual. This situation is reversed in civilian experience in which the majority of injuries are sustained as the result of vehicle accidents and falls. The diagnosis of visceral trauma is much more difficult when the injury is due to blunt force. Important features in the examination of pa-

tients with blunt abdominal injuries which aid in the decision for laparotomy are listed:

1. In the absence of other shocking injury, such as severe fracture, shock is a grave finding and implies extensive concealed hemorrhage, contamination by gastrointestinal contents, or both. In penetrating wounds of the hollow viscera the gravity of the prognosis is directly proportional to the degree of shock.

2. The diffuse pain of peritonitis is readily appreciated, but patients with abdominal trauma seen in civil life are usually brought to the hospital so promptly that diffuse peritonitis has not become established. Hemoperitoneum associated with ruptures of the spleen has been a nearly constant cause of pain. In this series there were 30 cases of injury to the spleen. The patients were conscious and the spleen was the only organ injured. Pain was noted by 27 of the 30. However, pain need not be a constant accompaniment of visceral damage. Twenty per cent of the patients having visceral injury have no pain.

3. The absence of peristalsis in the presence of abdominal injury is fair presumptive evidence of peritoneal contamination and is a strong indication for operation. In this series there were 20 cases of recent abdominal injury in which a hollow viscus was perforated. In only 2 of 16 such cases was peristalsis found to be present.

4. The presence of diffuse abdominal tenderness may connote peritoneal contamination of hemoperitoneum and is usually an indication for surgery. Tenderness may be absent in the presence of significant injury. This is true particularly of the cracked spleen, which is quiescent for a few days and later gives rise to secondary hemorrhage.

5. Spasm and tenderness usually coexist and are evaluated together. The distinction of tenderness and spasm originating within the abdominal wall from those of peritoneal insult is at times difficult.

6. Shifting dullness should dispel any doubt that surgery is indicated, unless there is a history of previous ascites. It usually means extensive hemoperitoneum and was rarely seen.

7. Vomiting has been unusual in the authors' experience. It usually occurred as a late result of ileus. The absence of vomiting in no way precludes the possibility of visceral injury.

8. Vomiting of blood after abdominal injury usually signifies a perforation of the stomach. The absence of gross blood in the gastric content does not rule out perforation of the stomach.

9. Blood in the urine should be sought always by catheterization if necessary.

10. While fresh blood by rectum is encountered only rarely, a digital examination should always be made and if blood is found, proctoscopic examination carried out.

11. With fractures of any of the lower ribs, kidney or splenic injuries are to be suspected. Although hepatic injuries must be considered, none of them were encountered in the present series. Fracture of the pelvis may be associated with injuries to the urethra and bladder.

In civilian trauma the solid organs are apparently injured more frequently than the hollow viscera, whereas in military trauma the hollow viscera are injured most frequently. HAROLD LAUFMAN, M.D.

GYNECOLOGY

UTERUS

Diverticulum of the Uterus (Diverticulo del utero). R. Domínguez Sisco and B. de Gavaller. *Rev. obst. gin.*, Caracas, 1949, 9: 97.

Diverticulum of the uterus, a rare condition, was found in a 39 year old woman, a para VII, who complained of a sudden acute abdominal symptom. Physical examination and the roentgenologic findings revealed the possibility of a dead fetus. The patient's condition became worse and immediate intervention was considered imperative. At operation the uterus appeared to have a large bleb nearly the size of the body itself in which there appeared to be an incarcerated dead fetus. The uterus was removed subtotally along with the tubes. On examination it was seen that nearly the entire fetus was incarcerated in a constricted diverticulum.

It was considered that the pathologic condition resulted from a previous curettement.

Stephen A. Zieman, M.D.

Uterine Endometriosis. Clinical Consideration (Las endometriosis del utero. Clínica de la endometrosis uterina). Juan Luis Sardi. *Obst. gin. lat. amer.*, 1949, 7: 349.

This article, dealing with the clinical aspects of uterine endometriosis, is the second of a series. The material here discussed consists of 257 cases of endometriosis observed at the Hospital Nacional de Clinicas at Buenas Aires, Argentina, in the years from 1930 to 1946. These are 113 cases (43.9 per cent) of internal uterine endometriosis, 55 cases of ovarian endometriosis, 40 cases of internal tubal endometriosis, 34 cases of peritoneal endometriosis, 7 cases of endometriosis of the genital ligaments, and 8 cases of perforating vaginal endometriosis.

This disease is never seen before the onset of menstruation and rarely before the twentieth year. It disappears after the menopause. On the whole, the symptoms (hypermenorrhea, metrorrhagia, dysmenorrhea) are not pathognomonic. About the only thing which will permit of a positive diagnosis before operation is Dionisi's sign: here, when the opaque medium is forced into the uterine cavity under considerable pressure there may appear small extensions of the substance into crypts or trajectories reaching part way through the uterine muscular wall, these crypts bearing contours reminiscent of the characteristic cystic formations of endometriosis. The author reproduces photographic proof from 1 case that this is exactly what these formations are.

When the intrauterine form of endometriosis becomes complicated by pregnancy (which is rare), the problem of uterine rupture during pregnancy itself or during labor, especially when this is accomplished with the aid of instrumentation, assumes serious proportions.

The androgens may be administered when endometriosis is causing serious discomfort; however, this alleviation is never more than temporary and is recommended only as an alternative until other measures can be instituted. Of course, if the menopause advenes the problem, as a rule, takes care of itself; however, if this physiologic period cannot be awaited, the only recourse is surgery. Fortunately, the condition is extremely rare in younger women, and therefore the procedures adopted can, and usually should, be radical. The operator should remove all of the adnexa and the major portion of the corpus uteri. There is no object, as a rule, in preserving the ovaries, since recurrence of the condition is thought to be due to the stimulus provided by the ovary. There is hardly ever any need to perform a total hysterectomy as the cervix is so rarely involved.

A special section in the article is devoted to the rare condition known as interstitial uterine endometriosis, also variously designated as interstitial endometriosis (Goodall), endolymphatic stromal myosis (Henderson), stromatosis (Te Linde), stromal endometriosis or adenomyosis (Novak), and endolymphatic fibromyosis (Frank). The cells of this growth exactly resemble the stromal cells of the endometrium. There is no evidence of metaplasia, abnormally deep-staining properties, or atypical mitoses, and the author thinks that it is a benign, slow-growing condition which insinuates itself through the uterine muscular wall between the muscle fibers, reaches the broad ligament, and begins to extend outward within the lymphatic spaces or immediately under the lymphatic endothelium. It is extremely rare and seems not likely to be diagnosed preoperatively. The effects of irradiation therapy on this condition have not been determined, and the best treatment seems to be radical adnexectomy and hysterectomy. Fortunately, there is hardly ever any serious objection by the older women to the radical procedure, and any extensions not removed seem to tend to regress after removal of the parent mass in the uterus, although, again, this may be the effect of removal of the ovaries.

John W. Brennan, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Primary Carcinoma of the Fallopian Tube. C. Y. Hu, M. L. Taymor, and A. T. Hertig. *Am. J. Obst.*, 1950, 59: 58.

Twelve more cases of primary carcinoma of the fallopian tube are added to the approximate number of 470 cases in the literature. These 12 cases occurred among 3,873 primary pelvic cancers in a total of 90,611 admissions to the Free Hospital for Women, from 1903 to 1948. The incidence is therefore .31 per cent of primary pelvic malignant tumors.

The majority of patients were between 40 and 65 years of age, 27 per cent with a history of sterility. Eight of the patients were postmenopausal and each of these had spotting or a return of bleeding. The most common symptom was leucorrhea, which was present in 10 of 12 cases. Pain, usually localized to the side of the lesion, was the second most common complaint. A palpable mass was detectable in each instance. The correct preoperative diagnosis was made clinically only once. The vaginal smear was positive in another.

The gross findings were variable. Salpingitis was the most commonly associated condition. Microscopically three grades were found: Grade 1 (papillary), 2 cases; Grade II (papillary-alveolar), 5 cases; Grade III (alveolar-medullary), 5 cases.

The authors feel that the management of choice is preferably complete hysterectomy, bilateral salpingo-oophorectomy, and postoperative irradiation. Five year survival for the 12 patients was 40 per cent, the survival decreasing with the more anaplastic growths. WARREN R. LANG, M.D.

MISCELLANEOUS

Hysterosalpingography in Habitual Abortion (La histerosalpingografía en el aborto habitual). JOSE M.ª SANCHEZ IBAÑEZ. *Rev. españ. obst.*, Valencia, 1949, 8: 451.

In a series of 6,927 pregnant women, abortion occurred in 762, or 11 per cent, in the course of the first gestation. Hysterosalpingographic studies done in 65 patients with habitual abortion demonstrated anomalies of the uterus in 20 per cent of this group. The pathologic changes can be divided into 2 groups: (1) arrest of development, resulting in infantilism or hypoplasia of the uterus, and (2) malformations. The last mentioned type was encountered in 10.7 per cent of the entire series of women with habitual abortion. The abortions occurred within the first 16 weeks of gestation in no less than 34 per cent of the women with malformations of the uterus. This high percentage demonstrates the importance of uterine malformations in the genesis of abortion.

Unless a double vagina or a double cervix is present, hysterosalpingography is the only means of diagnosing uterine malformations. It follows that hysterosalpingography is indicated in every case of habitual abortion.

While underdevelopment of the uterus requires hormonal therapy, anatomic reconstruction may be indicated in selected cases of malformation. Hence, the exact diagnosis, by hysterosalpingography, is essential. JOSEPH K. NARAT, M.D.

The Absorption of Radiopaque Substances Used in Hysterosalpingography. A Comparative Study of Various Aqueous and Oily Media. WILLIS E. BROWN, AGNES F. JENNINGS, and J. T. BRADBURY. *Am. J. Obst.*, 1949, 58: 1041.

The authors cite various unfavorable reports in the literature concerning reactions to certain radiopaque substances used in hysterosalpingography. Newer substances developed in the past decade led them to study five radiopaque media with reference to clinical suitability and absorbability.

The substances studied were rayopake, skiodan, lipiodol, iodochlorol, and lipoiodine, and the study was conducted at the University Hospital, Iowa City, Iowa.

Of 200 women on whom hysterosalpingography was done, absorption studies were made on 118; 38 women were subsequently subjected to laparotomy for gynecological disorders and their pelvic tissues studied for gross and microscopic evidence of inflammation.

The fractional method of injection was used, without manometric control, 8 to 12 c.c. of the medium usually being injected. Most of the patients experienced some discomfort during the procedure. In some, severe cramplike pains were experienced if the flow was rapid or the uterus was overdistended, and withdrawal of some of the media relieved the pain. Most of the patients experienced mild discomfort when the medium flowed into the peritoneal cavity. In each case an attempt was made to demonstrate tubal filling and peritoneal spill, and to follow absorption from the peritoneal cavity by a succession of films. With aqueous media, 10 minute intervals were used and with oily media, monthly films were taken.

Rayopake was used in 52 cases, skiodan in 24 cases, lipiodol in 16 cases, iodochlorol in 16 cases, and lipoiodine in 10 cases.

No significant gross or microscopic reaction occurred in normal tubes with either aqueous or oily media. In obstructed tubes, iodized oils produce foreign-body granulomas which bring about complete occlusion and "oil-retention cysts." Transient acute peritoneal reactions were found in patients injected with iodized oils, but not in those injected with aqueous media, because of their rapid absorption.

Clinical results with all of the radiopaque substances have been generally satisfactory. The differences between the aqueous and oily substances are discussed individually and by groups. The aqueous media are excreted by the kidneys, and a bladder shadow is usually visible within an hour. In occluded tubes the shadows tend to persist. This rapidity of absorption requires a different technique because the patient must be on the x-ray table when the injections are made.

The radiographic shadows are satisfactory for all agents used although the oily substance gives more dense shadows.

The viscosity is important in the diagnosis of tubal disease, and the material must be sufficiently viscous to remain in the tube long enough to take the films. The viscosity of rayopake and iodochlorol is satisfactory. Skiodan acacia is less viscous, the material spilling into the peritoneal cavity so rapidly that the tubes are frequently empty on filming and the peritoneal spill overshadows the tubal outline.

Lipiodol and lipoiodine require warming (a disadvantage) and the heating so reduces the viscosity that unsatisfactory films are often obtained as in the case of skiodan. With viscosity playing an important part, rayopake in the aqueous group and iodochlorol in the oily group were most satisfactory from this point of view.

The physical properties are important in handling. Lipiodol and lipoiodine must be heated; skiodan acacia is sticky and frequently causes the syringe to bind.

Clinical reactions varied also. Thirteen per cent of patients receiving skiodan had hives; lipoiodine was associated with severe pelvic infection in 2 patients, and although the series is small, it is noted that 2 of 3 patients with febrile reactions and both of those with septic complications had received lipoiodine. The oily media showed x-ray shadows of unabsorbed material up to 14 months the last time films were taken.

The authors conclude that the aqueous radiopaque substances are preferable in hysterosalpingography.

BYFORD F. HESKETT, M.D.

Limitations and Prospects in the Operative Treatment of Endocervical Carcinoma (Grenzen und Aussichten der operativen Behandlung des Kollumkarzinoms). J. AMREICH. *Geburtsh. & Frauenh.*, 1949, 9: 873.

Endocervical carcinoma infiltrates along the surface as well as in depth. Extension along the lymphatics is less common than infiltrative growth into the tissue spaces. The lymphatics involved accompany the uterine artery on the upper border of the cervical columns and Mackenrodt's ligaments and then in the connective tissue sheath of the anterior branches and stem of the hypogastric artery. The regional nodes include those found where the uterine artery and ureter cross, as well as the upper medial caudal iliac nodes and the lowest lateral cranial iliac nodes. The clue at operation is a fine network of stiff threads in the area at which the uterine artery begins to branch. Invasion of the lymph nodes in this area without visible involvement of the lymphatics speaks for involvement of the nodes in the hypogastric triangle. Therefore the operation requires removal of the upper third of the vagina, the uterus, adnexa, pelvic connective tissue, the ligaments supporting the uterus, and the regional lymph nodes. The ligaments supporting the rectum and bladder are to be trimmed as close to the organs as possible. The author's technique permits radical resection without dissection of the ureters.

In addition to radical resection, irradiation is recommended, as statistical improvement in the cure rate of 16 per cent to 17 per cent was noted at Vienna and Innsbruck. A cure rate of 36 per cent has been obtained by combined therapy. It is to be noted that with combined therapy, a cure rate of 42 per cent has been achieved by Stoeckel.

The radical operation has been extended to include resection of the neighboring organs (Brunschwig.) This was foreseen by Schauta in 1908, and has been performed with increasing frequency in the past, with the aid of antibiotics, transfusions, and newer techniques for the preservation of kidney function, and wider resections dependent on the technical experience and abilities of the individual surgeon. The extent of the operation has been increased laterally.

To reduce the number of recurrences after operative methods, it is necessary to ablate all of the posterior pelvic connective tissue up to the brim of the pelvis, with sacrifice of the hypogastric vessels and their branches, for it is along the vertical hypogastric sheath that carcinoma is left behind in the usual radical hysterectomy. By this means a cure rate of about 50 per cent could be achieved.

The operative mortality can be reduced by careful evaluation of the cardiovascular status of the patient, by the reduction of infection, and by primary ligation of large vessels, before sectioning.

Massive postoperative irradiation given in sufficient dosage is of prime importance, as well as thorough postoperative, periodic follow-up examination, so that early recurrences may be recognized and treated.

The biology of carcinoma must be taken into consideration. Since the time of Fischer-Wasel, it has been recognized that there is a constitutional, as well as a local disposition to carcinoma. The cancer patient must avoid carcinogenic drugs and foods. Further recommendations include exercise, change of climate, and an alkaline diet. The importance of proper care of cervical erosions, polyps, and chronic infections is stressed. LEONARD KRASNER, M.D.

The Development of the Radical Operation of Ernst Wertheim (1898) From the Abdominal Hysterectomy of W. A. Freund (1878) (Die Entwicklung der abdominellen Uterusexstirpation W. A. Freunds [1878] zur Radikaloperation Ernst Wertheims [1898]). REINHOLD ELERT. *Geburtsh. & Frauenh.*, 1949, 9: 887.

On January 30, 1878 Wilhelm Alexander Freund successfully performed the first total hysterectomy for carcinoma uteri, via the abdominal route. Prior attempts had ended fatally.

What had been known in the "older" literature as extirpation of the cancerous uterus consisted of supravaginal amputation of the corpus or amputation of the collum (Dupuytren, Lazzari, Osiander, Rust, Langenbeck). It was well recognized that these procedures were insufficient, but total extirpation was considered unfeasible.

In 1787, Wrisberg had reported complete removal of a prolapsed, inverted postpartum uterus by an ignorant midwife. In 1799 John Hunter had resected a postpartum, inverted tumor-bearing uterus. Bernhard reported a case similar to Wrisberg's in 1802, and in 1805, J. Clarke reported removal of a subpartum inverted uterus which was mistaken for a tumor. Wenzel, in 1816, suggested vaginal removal following artificial prolapse. Gutberlat, in 1814, suggested pushing the uterus high in the abdomen via

the vagina, followed by circumsection of the stretched tissue, hemorrhage being controlled by manual pressure on the iliac arteries. The operation, which ended fatally, was undertaken once in 1825 by von Langenbeck. Successful extirpation of an unprolapsed uterus was performed by Sauter in 1822.

The operation was improved by von Siebold in 1827, Blundell in 1828, and Recamier in 1829, but the mortality rate remained high.

From 1830 to 1878 the abdominal route was considered unfeasible, and apparently was abandoned until Freund's success in 1878. Czerny, in 1878, reported an improved technique for vaginal total hysterectomy and in 1880 reported 81 cases with 32 per cent operative mortality, whereas in 66 cases of abdominal hysterectomy, Ahlfeld reported a 72 per cent operative mortality. Vaginal hysterectomy was further improved by Duehrssen in 1891 and Schuchardt in 1893, who increased the extent of resection and exposure of the parametrium by paravaginal incision. Schauta performed the first radical uterus extirpation via the vaginal route in 1901. The technique has been modified and improved by Amreich in 1924, Stoeckel in 1927, Kraul in 1941, and Navratil in 1949.

The abdominal operation, however, was not abandoned. Exposure was improved by Alberts in 1879, Kuhn in 1881, and by Freund. Hemostasis was improved by ligating smaller masses of tissue and finally by isolation and ligation of the uterine artery by Stimson in 1899. The danger of infection, which accounted for almost 50 per cent of the mortality, was diminished by various methods of drainage through the vagina. The injuries to the ureters and bladder soon resulted in techniques for their preservation. Catheterization of the ureter to aid recognition of this duct was suggested by Massari, who also suggested lateral retraction of the ureter. However, in 1895, Rumpf, Ries, and Clarke, independently of each other, developed the technique of ureteral dissection.

Recurrence of the tumor remained the greatest problem, and in 1881 Freund began to remove infiltrated lymph nodes. Ten years later Veit removed grossly infiltrated parametrium with no resultant improvement. It remained for Mackenrodt to demonstrate that microscopically cancerous infiltration was present in what appeared grossly normal tissue. It was apparent that not only the uterus and parametrium but also pelvic connective tissue must be removed. Once the "ureter problem" was solved by Rumpf, Ries, and Clarke, the groundwork was laid for the radical hysterectomy.

Rumpf, in 1895, recommended resection of the uterus, parametrium, sacrouterine ligaments, and pelvic connective tissue, after ligation of the uterine artery at its origin, and removal of the hypogastric lymph nodes. Clarke and Ries varied the technical steps required, and it remained for Wertheim to standardize the operation. This required the widest possible removal of the parametrium and pelvic connective tissue, including the lymph nodes. The goal was "utmost radicalism, by means of subtlest development of technique."

Later modifications by Kroenig, Bumm, Franz, and Latzko did not change the basic operation, but were in the nature of variations of technique.

LEONARD KRASNER, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Remarks on a Series of 105 Extrauterine Pregnancies (Remarques sur une série de 105 grossesses extra-utérines). L. GIOANNI and L. WIRTZ. *Rev. fr. gyn. obst.*, 1949 44: 288.

Preliminary to the study of fertility of women operated on for extrauterine pregnancies, observations were made on 105 cases of extrauterine pregnancy in a 4 year period. The age groups were as follows: less than 30 years, 36 women; from 30 to 35 years, 24 women; from 35 to 40, 29 women; and more than 40 years, 16 women. The extrauterine pregnancy was the first pregnancy in 28 cases, the second in 26, the third in 25, the fourth in 12, and the fifth or more in 14. The number of years separating the extrauterine pregnancy from the preceding pregnancy was less than 5 years in 40 cases, from 5 to 10 years in 21 cases, and from 10 to 20 years in 16 cases. The pregnancy immediately preceding the extrauterine pregnancy was a normal pregnancy in 49 cases, a miscarriage in 19 cases, and another extrauterine pregnancy in 19 cases. In 30 per cent of the cases there was macroscopic evidence of an inflammatory lesion in the fallopian tubes. With regard to the anatomic location of the lesions, 61 were on the right side and 41 on the left; there were no bilateral lesions, and only 1 was accompanied also by an intrauterine pregnancy. With regard to the relation of the character of the lesion to its site in the tube, it was found that an encysted hematocele was the form in which the pregnancy was found when the ovum lodged in the ampulla, while a ruptured tube was found when the ovum lodged in the isthmus. Although generally a hematocele leads to tubal abortion and spillage into the peritoneal cavity follows a rupture of the tube, one occasionally sees spillage into the peritoneal cavity from a hematocele without tubal rupture, and a rupture of the tube following a hematocele and a tubal abortion.

With regard to menstrual symptoms preceding operative intervention in these cases, a review of the cases in which there was peritoneal spillage found at operation (41 cases) disclosed the following observations: in 23 cases there was a lapse of periods from 2 days to 8 weeks, followed by an acute episode with no bleeding; in 7 cases there was a similar lapse in periods, followed by metrorrhagia and then the acute episode; in 5 cases the last period was apparently normal, followed by hemorrhages; and in 6 cases the last period was apparently normal, the acute episode appearing in the course of the following cycle. In 46 cases of those in which an encysted hematocele was found (61), the authors noted a delay in periods from 2 weeks to 3 months which was followed by metrorrhagia; in 11 cases, apparently normal last periods were followed soon or after a few days by hemorrhages; and in 3 cases there was a delay in periods without hemorrhages. In general, when there is rupture into the peritoneal cavity, the delay in periods is generally short and hemorrhages are rare; in cases of hematocele, the delay in periods is generally long and hemorrhages are the rule.

With regard to the signs of peritoneal spillage, the authors find that the weakness of the pulse is the most constant sign, even when the pulse is not accelerated. An interesting prognostic sign is the coldness of the nose, lips, and tongue, and hemorrhage is generally of first importance when this sign is noted. Abdominal contracture is exceptional, while abdominal warmth is the rule. Abdominal pain is an inconstant sign but significant when present. Cullen's sign was only observed in 2 cases. Dullness in the flanks is inconstant.

In cases of extrauterine pregnancy without peritoneal spillage the red blood count was between 3,000,000 and 4,000,000, the level of hemoglobin being between 50 and 80 per cent; the white cell count showed an increase in 21 cases and a decrease in 14 cases.

Surgical intervention consisted of unilateral salpingectomy in 52 cases, unilateral adnexectomy in 33 cases, bilateral salpingectomy in 6 cases, salpingectomy on one side and adnexectomy on the other in 8 cases, and subtotal hysterectomy in 2 cases with conservation of the ovaries in one and a unilateral adnexectomy in the other. Reproductive function was preserved in 84 per cent of the cases and conservation of ovarian function in all of them. In no cases in which the abdomen was entered was a drain left in place.

Transfusions were indicated in 31 patients, and of these 28 received the blood that was recovered from the peritoneal cavity. No reactions were encountered.

PHILIP B. CHASE, M.D.

Etiology of Eclampsia. Water Balance. WM. J. DIECKMANN, A. G. SESKI, C. P. MCCARTNEY, R. C. SMITTER, and Others. *Am. J. Obst.*, 1949, 58: 1014.

Dieckmann and his associates review extensively their own views in regard to eclampsia. They feel that they have been unable to reduce the incidence of pre-eclampsia and eclampsia even by the strictest dietetic and obstetric care. They believe that prenatal care leads to an earlier diagnosis, and that the institution of corrective measures is responsible for the general reduction of frequency of the disorder.

Their studies indicate that the elimination of water is delayed to some extent in all pregnant women, but more markedly in those with toxemia, and that water is stored in the lower extremities, particularly in the last trimester of pregnancy when the back pressure caused by the enlarged uterus is definitely increased in the veins. The accumulation of water in the extremities may also be accompanied by the same phenomena in the kidneys and liver, thus

impairing the function of these two organs and subsequently leading to some of the complications of toxemia.

In conclusion, they recommended that the pregnant woman should drink sufficient water throughout the day so that she voids approximately 2,000 c.c. of urine in 24 hours. In addition, the amount of sodium, chloride, and potassium in the diet should be restricted to 2 gm. of sodium, 6 gm. of chloride, and 2 gm. of potassium every 24 hours.

JAMES F. DONNELLY, M.D.

Intrauterine Fetal Mortality (Muerte fetal intrauterina). JUAN LEON. *An. Serv. obst. Hosp. Cosme Argerich*, 1948, 2: 7.

The author's statistics are based upon a material of 1,702 deliveries (1,721 infants) made from September 1, 1946 to August 31, 1948, inclusive. These infants included 78 premature children. Of the whole number, 40 were born dead; this number, however, included those whose heart was still beating when delivered but whose breathing could not be established. Nine of these infants were premature, and 1 was adjudged postmature (Beruti and Roust's criteria). The body weight of these 40 dead infants varied between 1,000 and 2,499 gm. in 15 instances, between 2,500 and 3,499 gm. in 18, between 3,500 and 4,499 in 4, and was more than 4,500 gm. in 3. In this material there was only one pair of twins. Twenty-six of the 40 fetuses were born spontaneously, and the pregnancy was terminated operatively in 14 instances.

Twenty of these fetuses died before the initiation of labor. In 7 of these 20, the cause of death could not be determined. Of the remaining 13 deaths, 4 were apparently due to the effects of the eclamptic state, 1 each was due to idiopathic icterus of gestation, hypertension, hydramnios, congenital malformation (anencephalia), and placenta previa, respectively; 2 deaths were due to hemolytic disease, and 3 were due to anoxemia (cord about neck).

Of the 20 deaths occurring during labor, 2 were the result of detachment of the placenta, and 4 of loops of cord about the neck, while 1 each was the result of prolapsed cord and of uterine dystocia. Forceps had been used in 6 cases, pelvic extraction in 3, internal version in 2, and abdominal cesarean section in 1 case. Contributory causes in this last group of 12 deaths were, of course, the anomalies which necessitated the operative interference.

A few (9) of the infants were autopsied. Meningeal hemorrhage was observed in 2 infants, rupture of the tentorium cerebelli in 4, and cardiopericardial adhesions with hematomas of the suprarenal glands were found in 1 infant.

With reference to the mothers of these fetuses, 29 were married, 11 were single, 23 were primiparas, and 17 were multiparas. None was younger than 13 years of age; 17 were between 15 and 24 years of age, 10 were between 25 and 29 years, and 13 were 30 years old or more. More than half of these mothers entered the clinic with a dead child. Twelve of the women had visited the prenatal clinic; 28 had not. Of the 17 mothers whose children died during labor, 13 had not visited the clinic previously. If the mothers who had not visited the prenatal clinic previously and entered with a dead fetus be excepted, the fetal mortality of the author's clinic may be considered as favorable, although capable of betterment.

In the hope of improving these results, the author makes a number of suggestions. A large number of prenatal clinics should be maintained in strategic locations. Midwifery should be controlled or suppressed, and ample financial assistance should be given the pregnant woman, since the author believes that many of the dead fetuses were constitutionally inferior and that this inferiority may have been the result of a defective, or subnormal, ovular cell which was, in turn, the result of a physically dibilitated maternal organism. JOHN W. BRENNAN, M.D.

Cancer of the Cervix Complicating Pregnancy. PAAVO VARA. *Ann. chir. gyn. fenn.*, 1949, Supp. 3

From 1926 to 1947 at the Women's Clinic of the University of Helsinki, there were 18 cases of cervical carcinoma complicating pregnancy. The incidence was 0.0155 per cent of the 121,969 obstetric and gynecologic patients; 0.020 per cent of the total number of obstetric patients (90,644); and 0.69 per cent of the 2,595 cases of cervical cancer observed during that time.

The ages of the patients ranged from 27 to 44 years, with 56 per cent in the 30 to 39 age group and 22 per cent each in the 20 to 29 and the 40 to 49 age groups. Three patients (17 per cent) were primigravidas. Ten patients were in the first half and 8 in the second half of gestation. Four cases (22 per cent) were not diagnosed until the patient reached term although bleeding had been present earlier.

The symptomatology was found to be the same as in nonpregnant patients and was most often bleeding, either frank or a blood-stained discharge. Postcoital bleeding was common. For this reason the author advises speculum as well as bimanual examination in studying bleeding during pregnancy. Occasionally, even then, if the carcinoma is in the canal the diagnosis may be erroneously construed to be placenta praevia, and it has been pointed out by Hofmeyer that the incidence of placenta praevia in cervical malignancy is definitely higher than normal.

According to the International Classification, 11 (61 per cent) of the patients had stage 1 cancer, 3 (17 per cent) had stage 2, and 2 (11 per cent) each had stage 3 and stage 4 cancer. Histologically, all of the carcinomas were squamous-celled except one which was an adenocarcinoma. Various histologic changes such as glandular hypertrophy and granulomatous nodules may simulate cancer. In the author's series no clear-cut decidual reaction was detected.

The treatment in most cases was primarily surgery followed by irradiation. However, it must be re-

alized that each case should be decided upon individually considering such factors as the general condition of the patient, the stage of cancer, the duration of the pregnancy, and the viability of the fetus. Wertheim's radical hysterectomy was performed in 13 (72 per cent) of the cases while cesarean hysterectomy followed by roentgen therapy was carried out in 2 (11 per cent). Radiation was used exclusively in 3 cases (16.7 per cent).

There was no primary mortality attributable to treatment. The 5 year survival rate of the patients treated by Wertheim was 75 per cent, with 1 with stage 1 and 2 with stage 2 cancer dying within 5 years. Both patients treated by cesarean hysterectomy succumbed before 5 years had elapsed after treatment. The women treated by irradiation all survived 5 years. The overall 5 year survival rate was 72.2 per cent. In 7 cases in which it seemed quite definite that the carcinoma preceded the pregnancy, the growth of the cancer did not seem accelerated.

The author believes that in operable cases, regardless of fetal viability, a radical operation followed by irradiation is desirable. With viability the operation is preceded by cesarean section. Local radium application should not be resorted to preoperatively because of its effect on the fetal germ cells. In inoperable cases in which the child is viable, cesarean section, supravaginal hysterectomy, and then radium and subsequent roentgen therapy are preferable. In early inoperable cases with pregnancy roentgen therapy should be administered and later radium should be inserted locally after abortion has occurred. WARREN R. LANG, M.D.

LABOR AND ITS COMPLICATIONS

Prophylactic External Cephalic Version in Breech Presentation. PAAVO S. JOKELA. *Ann. chir. gyn. fenn.*, 1949, Supp. 3.

Fetal and neonatal mortality is about five times greater in breech than in vertex presentations. It averages somewhere around 7 per cent for multigravidas, and from 15 to 25 per cent for primigravidas. Consequently the author has adopted the practice of external cephalic version. He discusses 1,031 cases of breech presentation. Of these, 556 (53.9%) were in primigravidas.

Version was attempted from the twenty-fourth week of pregnancy until the onset of labor, and there were 1,172 attempts at version, or 1.13 attempts per case. Successful results were obtained in 806 cases (78.1%). Of these, 108 (14%) reverted to breech presentation. There were 86 (25.4%) spontaneous versions among cases not originally successful. Primigravidas were examined during the thirtieth week of pregnancy and multigravidas during the thirty-fourth week. Following version the woman was seen weekly until the presentation remained for a period of several weeks.

Version is performed with the patient on an ordinary table with the legs freely bent. The bladder and bowels should be empty. The process takes about 10 minutes and is begun by elevating the breech out of the pelvis and then turning the child so as to maintain normal flexion. Force should not be used and fetal heart tones should be checked frequently. The most favorable time in primigravidas is from the thirtieth to the thirty-second weeks, and in multigravidas from the thirty-fourth to the thirty-seventh weeks. Breech presentation has been reduced by about 1 per cent.

Although the literature mentions disturbance in cord blood supply, prolapse of the cord, compression or knot in the cord, placental separation, uterine rupture, premature rupture of the membranes, premature delivery, and compound presentation as possible complications of version, the author found that these were rare. With the exception of a weakening of fetal heart during the turning, version is usually uneventful if performed gently and not persisted in when resistance is encountered.

WARREN R. LANG, M.D.

On Large (Complete) Lacerations of the Perineum as Complications of Labor. AHTI POHJALA. *Ann. chir. gyn. fenn.*, 1949, Supp. 33.

During the period from 1935 to 1946 at the Second Women's Clinic of the University of Helsinki, in Finland, there were 20,378 deliveries, and of these 6,489 were complicated by perineal lacerations (31.9%); 5,575 of the lacerations (85.91%) were first degree, 875 (13.48%) were second degree, and 39 (.60%) were third degree lacerations. Of the total number of deliveries, episiotomy was utilized only 159 times (6.62 per cent)!

On further analyzing the third degree lacerations (.19 per cent of all deliveries) 6 were incomplete third degree (tear into the substance of, but not through, the external anal sphincter), 31 were complete third degree (tear through sphincter), and 2 were fourth degree (through anal mucosa). The great majority (37) occurred in primigravidae.

The etiological factors are varied and often multiple in a given case. Operative delivery, abnormal labor mechanisms, contracted pelves and primigravidity are the most important. In addition, the late pregnancy toxemias are also significant. Of less importance are a sharp pubic angle, vaginal and perineal contraction, and uterine inertia. The time of amniotic sac rupture, and the size of the fetal head seem to play only a minor part in causing lacerations.

The role of the obstetrician is often the most crucial one, especially with regard to operative technique. Episiotomy should be performed sufficiently early and under adequate anesthesia.

The author advises immediate repair, first suturing the torn rectum, then the anal sphincter, the perineal musculature, the vaginal wall, and finally the skin. A strong muscular wedge is thus formed between the vagina and rectum. Bowel movements are prevented for a period of about 1 week. The prognosis in general is excellent.

WARREN R. LANG, M.D.

Self-Administered Analgesia in Labor, with Special Reference to Trichlorethylene. E. H. SEWARD. *Lancet*, Lond., 1949, 2: 781.

The author studied the self-administration of analgesia in labor. The advantages of this method are: (1) mother and baby are free of drug action between uterine contractions, which occupy only a quarter of the time; (2) the mother has something to do when it becomes difficult for her to remain passive; (3) the method can be utilized by the untrained—i.e., midwives. The disadvantages are: (1) dryness of the mouth from use of the mask; (2) intermittent analgesia does not relieve backache between pains; (3) the method is a burden to the mother, especially if the labor is prolonged.

One hundred and fifty cases were studied with the use of two gas mixtures in successive trial periods of about one-half hour, near the end of the first stage of labor. Patients were then asked to compare the two mixtures used. Three mixtures were utilized in the complete study: (1) 50 per cent nitrous oxide, 50 per cent air; (2) 75 per cent nitrous oxide, 25 per cent oxygen; and (3) 0.5 per cent trichlorethylene, 99.5 per cent air. From his observations, the author believes that the nitrous oxide and oxygen mixture and the trichlorethylene and air mixture are both better than nitrous oxide with air. Nitrous oxide with oxygen and trichlorethylene with air are about equally effective.

Trichlorethylene is a potent agent. The effect is cumulative so that after some time the patient becomes drowsy (after 6 hours in labor). There does not appear to be any effect on uterine contraction with intermittent administration. The drug does not tend to excitement, as does nitrous oxide. The trichlorethylene and air mixture works best with labor of normal duration. One case of maternal arrythmia occurred in 150 labors studied. Fetal bradycardia results from lack of oxygen rather than from the drug itself. Inhalation by the mother for more than 6 hours in some instances may produce a sleepy baby. WARREN R. LANG, M.D.

PUERPERIUM AND ITS COMPLICATIONS

Behavior and Significance of the Dermographic Changes During the Puerperal State (Sul comportamento a sul significato delle variazioni dermografiche durante lo stato di puerperalità). PIERLUIGI BIANCHI. *Riv. ital. gin.*, 1949, 32: 285.

The present article is based on a material of 280 women. Of these, 140 were pregnant and 80 were in the postpartum period. Sixty were controls, that is, they were patients with various gynecological conditions other than those mentioned. The pressure stimulation streaks were made with the Lunedei dermograph, set at about the point of 10 (100 gr. of pressure). The stimulated areas of the chest ran longitudinally down the anterior surface of the sternum between the breasts, and those on the abdomen ran crosswise between the navel and pubis from one anterior superior iliac spine to the other. On the thigh the lines again ran longitudinally down along the anterior surface. The linear phenomena thus induced were classified into 4 types. The first type comprised the pure white lines of vasoconstriction, the second type included those consisting of a thin red line surrounded by a wide pale halo of vasoconstriction, the third type consisted of a wide red mark bordered by a narrow halo of pallor, and the fourth type, the purely red lines of vasodilatation.

In the controls the lines produced on the chest were, as a rule, of the fourth type; on the abdomen the third type predominated; and on the thigh the reaction of the second type was the usual finding.

In the pregnant group there was an early and pronounced increase in the manifestation of dermographism. This consisted of an earlier response (shortened latent period) and a longer continued one; the threshold of response was smaller (50 gm.). The third type, or response of the control group, became largely the second type. In the abdomen, in fact, the first type came to predominate. At about the time of delivery the chest streaks assumed the characteristics of the third type and the abdominal streaks those of the second type, while those of the thigh tended toward the first type, that is, they were all white or showed a very narrow, transient red line down the center.

During the puerperal period the phenomena tended to change their chronometric qualities and their types in the inverse direction to that described for the pregnant state; that is, the latent period became longer and the duration shorter. The type became that described for the controls. By the eighth day of the puerperium the condition of sensitivity apparently returned to normal; however, a week or so later a flare-up was apt to develop for a few days. This flare-up involved mostly responses of the fourth type.

An exception to the regular trend of the reaction in pregnancy and puerperium was observed in the chest responses of the lactating mother, in whom the red streaks (perhaps with a narrow halo of pallor) tended to remain unchanged throughout the period of nursing. In the mothers who, for any reason, did not go through with lactation, the responses of the chest tended to act like those of the rest of the body. This peculiar behavior of the lactating mother is used as an argument for the metameric theory of skin response to stimuli from the other organs of the body.

The author believes that these results show that the response seen in dermographism is not a local one—or at least not a purely local one—but a general reaction conformable to the general orientation of the sympathetic nervous system in pregnancy and in the puerperium, that is, the type of reaction is sympathicotonic (pallor) or parasympathicotonic (redness), with the former predominating in pregnancy and the latter in the puerperium.

JOHN. W. BRENNAN, M.D.

An Inquiry into Late Postpartum Hemorrhage. GEORGE F. MELODY. *Am. J. Surg.*, 1949, 78: 821.

The author defines late postpartum hemorrhage as any genital tract bleeding coming on 24 hours to

3 months postpartum, and amounting to massive sudden exsanguination or continued daily leakage. Ten per cent of puerperal patients have excessive bleeding after the first 24 hours. The author suggests that early ambulation and estrogens (to suppress lactation) might be contributory factors, but by and large the commonest etiologic factor is retained fetal elements.

Late postpartum hemorrhage may occur as a result of systemic diseases such as blood dyscrasias, personal hemorrhagic idiosyncrasy, capillary fragility, vitamin deficiency, liver disease, hypothyroidism, and the use of dicumerol or heparin, and gynecic disorders such as vulvovaginal hematoma due to ruptured varicosities, or to trauma incident to forceps delivery, vaginal wall lacerations or occult rupture of the vault, bleeding from cervical lacerations (catgut repairs and second degree erosions with infection), cervical carcinoma, cervical stumps of posthysterectomy section, and other conditions. In addition, the author lists and discusses the treatment of retained placental tissue, succenturiate lobe, placenta previa accreta which cannot be completely removed at operation, retained blood clots or membranes, persistent placental site (subinvolution—a very common cause of bleeding), hyaline degeneration of decidual remnants which have become secondarily vascularized, dysfunctional uterine bleeding per se postpartum, suppression of lactation, uterine hypotonia, hydramnios, multiple pregnancies, polyps, myomas, anatomical defects, and choriocarcinoma (of which repeated hemorrhage is the principal symptom). Other gynecic, but rare, conditions existing as a possible cause of delayed postpartum bleeding are endometrial carcinoma, sarcoma, hemangioma, endometritis, tuberculosis, inversion or rupture of the uterus (unrecognized), and aneurysm of the uterine artery.

JANE C. MACMILLAN, M.D.

NEWBORN

Treatment by Exsanguination-Transfusion of the Newborn Suffering from Hemolytic Disease (Traitement par l'exsanguino-transfusion du nouveau-né atteint de maladie hémolytique). S. BUHOT. *Sem. hôp. Paris*, 1949, 25: 2913.

The author shows that the only logical treatment of hemolytic disease of the newborn is blood replacement which should be as complete and as early as possible; it should be accomplished at least before the clinical appearance of any morbid symptoms; in other words, it should be preventive. The quantity of blood used amounts generally to two volumes of the blood mass of the child, or about 500 c.c. The most common technique is that of Diamond, in which the umbilical vein is used during the first hours following birth. When the child is more than 6 hours old or when the introduction of the catheter into the umbilical vein is impossible, Buhot has exposed the arch of the internal saphenous vein to make the catheter reach the inferior vena cava, but in some instances this has led to disturbance in the development of the lower extremity because of aseptic thrombosis of the iliac vein. However, this drawback can be avoided by exposure of the umbilical vein in its extraperitoneal course which remains permeable for several weeks and in which thrombosis does not have to be feared since it is physiologic in this case. The blood used for the transfusion must belong to groups A, B, O, or O supplemented, if necessary, by specific substances to neutralize anti-A and anti-B agglutinins. Buhot has always used Rh negative blood from a nonsensitized donor, collected aseptically on sodium citrate (from 1.5 to 2 gm. for 500 c.c. of blood) immediately before the exsanguination-transfusion. In general, the intervention is well supported by the newborn.

The problem of the indication for exsanguination-transfusion may arise in a child who is suspected of having hemolytic disease but at birth presents only such slight signs that they may pass unobserved, or in a child who in the hours or days following birth shows clinical signs of the disease although the maternal isoimmunization was unknown until then.

The indication of exsanguination-transfusion at birth presupposes the prenatal discovery of the maternal isoimmunization, but this diagnosis in itself does not necessarily mean immediate intervention in the newborn for two reasons: the father may be heterozygotic and consequently procreate safe Rh negative children, or it is possible that the child is born healthy although it possesses the antigen responsible for the maternal isoimmunization. In fact, the indication of exsanguination-transfusion at birth must rest on the clinical, hematologic, and serologic examination of the newborn. This examination does not always allow any prediction as to the future gravity of the disease and some infants are bound to recover without exsanguination-transfusion; nevertheless, Buhot has followed the rule of performing the transfusion when the direct test of Coombs was positive, even in the absence of clinical or hematologic signs. This decision was reached because of the fear of icterus of the cerebral nuclei, which may occur in relatively slight cases, and also because of the usual harmlessness of the intervention.

The indication of exsanguination-transfusion some time after birth requires the appearance of pathologic phenomena and, since early treatment is imperative, the problem consists in discovering the disease as soon as possible. Therefore, any icterus appearing in the first 24 hours of life must be suspected and impose examination of the maternal blood serum and red cells and of the red cells of the child. The indication of the exsanguination-transfusion itself must be based on (1) the date on which the child is seen and the evolution of the disease (aggravation in the last 24 hours, stabilization, or beginning improvement), (2) the gravity of the signs—for instance, the anemic forms with little or no icterus which are generally observed after the fifth day are curable spontaneously or by simple transfusion—and (3) the familial antecedents.

The study of Buhot's cases shows that, regardless of the apparent gravity of the maternal isoimmunization or of the date on which the child is treated, the efficacy of exsanguination-transfusion depends on the clinical condition of the child at the time of treatment. Infants treated before the appearance of clinical signs of the disease and those treated after the appearance of clinical signs but in which the icterus cannot be called grave are regularly curable by exsanguination-transfusion; however, some of the infants in the second group may present nervous sequelae. Infants with grave signs, such as the nervous syndrome which is nearly always associated with respiratory disturbances, the hemorrhagic syndrome, and the edemas, are generally not influenced by exsanguination-transfusion which comes too late.

To avoid the possibility of a detrimental influence of Rh antibodies in the maternal milk, it is advisable to put the newborn on a wet-nurse's milk, or to extract and boil the mother's milk, thereby safeguarding the future of maternal nursing.

RICHARD KEMEL, M.D.

MISCELLANEOUS

Prolapse of the Lumbar Intervertebral Disc as the Cause of Backache in Women (Der lumbale Bandscheibenvorfall als Ursache von Kreuzschmerzen bei der Frau). KARL KNOERR. *Geburtsh. & Frauenh.*, 1950, 10: 60.

The author emphasizes that backache, lumbago, and sciatica in women with negative gynecologic findings may frequently be caused by protrusion or herniation of the intervertebral disc. In 90 per cent of the cases the fourth or fifth lumbar disc is involved. In most cases the nucleus pulposus of the disc protrudes laterally of the posterior longitudinal ligament into the spinal canal and exerts pressure on the spinal nerve roots.

The prolapse may be incomplete, complete, or fixed. Clinically backache and lumbago precedes in most cases the typical ischialgia. Incomplete prolapse is characterized by intermittent attacks of backache and lumbago with free intervals. The most important sign of complete herniation is the disturbance of sensibility. Lesion of the fifth disc causes hypesthesia on the lateral and posterior aspect of the thigh. In prolapse of the fourth disc sensory disturbances are found on the medial aspect of the leg and foot, and the patellary reflex is decreased or absent.

WERNER M. SOLMITZ, M.D.

The Septic Abortion Kidney. J. P. WYATT and H. GOLDENBERG. *Am. J. Obst.*, 1950, 59: 337.

Three cases of lower nephron nephrosis following septic abortion in young women are reviewed. The outstanding features of the three cases were: induced septic abortion at 10 to 14 weeks of pregnancy with shock and uteroplacental damage, and the sequel of renal shutdown with acute insufficiency, terminating fatally in 8 to 11 days.

The pathogenesis of this condition according to the theories of Trueta and those of Young, Bywaters, and Mallory is discussed. It is believed that the violent means of interrupting the pregnancies was the precipitating cause of this abortion—the uremic syndrome. Such factors must always be kept in mind in order to prevent this complication of kidney failure which may follow an induced abortion.

JOHN R. WOLFF, M.D.

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Hyperfunctioning Tumors of the Adrenal Cortex. A Study of 9 Cases. WALTMAN WALTERS and RANDALL G. SPRAGUE. *J. Am. M. Ass.*, 1949, 141: 653.

Hyperfunctioning tumors of the adrenal cortex are capable of producing a wide variety of clinical syndromes, some of which defy precise classification. Many of the symptoms produced by such tumors are tentatively explainable on the basis of overproduction of certain steroid hormones of the adrenal cortex whose physiologic effects are fairly well understood.

Certain clinical data obtained in 9 cases of adrenal cortical tumor in which surgical treatment was employed were reviewed. In each instance in which the urinary excretion of 17-ketosteriods and corticosteriods (reducing steriods) was estimated preoperatively and postoperatively, it was noted, as expected, that there was a marked decrease following excision of the tumor even though the excretion of these steriods preoperatively was normal.

Several aspects of the surgical treatment of adrenal cortical tumors were discussed. Important among these was adequate preoperative and postoperative treatment with adrenal cortical extract and physiologic solution of sodium chloride in order to prevent fatal acute adrenal cortical insufficiency owing to atrophy of the contralateral adrenal gland within the first few days after removal of the tumor.

Evaluation of the Merits of Cystoscopy and Retrograde Pyelography in the Management of Renal Trauma. LAZARUS A. ORKIN. *J. Urol.*, Balt., 1950, 63: 9.

The author evaluates the relative merits of excretory and retrograde pyelography in 37 cases of renal trauma. In 32 of these, excretory urograms were taken and 40 per cent of these were satisfactory for diagnosis. In 9 of the cases the kidney appeared to be normal in the pyelograms; however, in 4 cases the subsequent course and further studies with retrograde pyelograms revealed severe kidney injury.

In the past it has been said that failure of the injured kidney to excrete the contrast substance is significant of severe renal injury. In this group, there was no excretion on the traumatized side in 9 patients. In 6 of these, retrograde pyelograms revealed a normal renal pelvis and ureter. In the group with poor visualization and incomplete filling, retrograde study was invaluable in determining the extent of the lesion. In 31 of the 32 cases, an excretory pyelogram was satisfactory for diagnosis of the uninjured kidney, which would bear out the contention that the most important information obtainable from the excretory urogram is the demonstration and condition of the contralateral kidney.

Cystoscopy and retrograde pyelography, with use of the gravity method, was performed in 25 cases. The procedure is contraindicated in patients who are critically ill and in those in whom the condition is such that immediate surgical interference is indicated. It would seem to be hazardous in those individuals who are in shock and who have extensive associated injuries. The retrograde pyelograms were satisfactory for diagnosis in all cases. The clinical course and operative findings in these cases confirmed the retrograde diagnosis in every instance. The author believes that excretory urography is often misleading and does not always portray the actual traumatic lesion and that cystoscopy and retrograde studies should be done routinely in every instance of renal injury. He analyzes the arguments against retrograde pyelography and considers that the possibility of introducing infection is more theoretical than actual, with the use of present-day contrast solutions and the newer antibiotics. The possibility of increasing or reactivating hemorrhage has also been exaggerated. He has been able to find only one such occurrence which, he believes, may have been coincidental.

The argument that all cases of renal trauma, with the exception of those requiring immediate operative intervention, should best be left alone and treated conservatively, would seem to be unjustified in the view of the analysis of these cases. The author believes that better end results are obtained if one establishes the principle that the indications for operative intervention in the nonemergency group should be determined by the pyelographic evidence of extravasations, before secondary symptoms and complications with a deterioration in the clinical picture makes interference necessary. With the demonstration of extravasation the case should be considered immediately operative, when the condition of the patient permits, and the type of surgery to be done should be decided by the operative findings.

The author concludes that excretory urography should be done as soon as possible after admission in every patient, wherever feasible. Its greatest usefulness is in demonstrating the presence and configuration of the uninjured kidney. It has been disappointing in assessing kidney damage on the injured side. Cystoscopy and retrograde pyelography should be routine in every case of renal injury if the patient is not desperately ill. The hazards of case management without cystoscopy far outweigh any potential risk. ROBERT O. BEADLES, M.D.

Spontaneous Renoduodenal Fistulas. J. DUDLEY KING. *Radiology*, 1950, 54: 82.

Spontaneous renoduodenal fistulas are rare. Like most spontaneous renovisceral fistulas, they are associated with, and secondary to kidney infections with or without upper urinary tract obstruction.

The author reviews the 6 previous cases of renoduodenal fistula reported in the world literature, and

adds one of his own. The diagnosis was confirmed antemortem in only 2 of these 7 cases. Pathologic study of the kidney was made in 6 of the cases, and in each instance there was associated renal infection. In 4 instances tuberculosis was present. Hydatid cysts and pyelonephritis each were associated with the fistula formation in one case.

In the case reported by the author, a diagnosis of a nonfunctioning right kidney was made on intravenous pyelography performed on a patient with multiple urethral strictures. No gastrointestinal symptoms were present. Retrograde pyelography revealed a communication between the kidney and duodenum. An upper gastrointestinal study confirmed this finding. Nephrectomy was performed. Attempts to invert the fistulous tract were unsuccessful; it was simply divided and ligated. The patient made an uneventful recovery.

JOHN T. GRAYHACK, M.D.

Multiple Cysts of the Renal Pyramids—"The Sponge Kidney" (Sur une rare maladie kystique multiple des pyramides rénales le "rein en éponge"). ROBERTO CACCHI and VINCENZO RICCI. *J. urol. méd.*, Par., 1949, 55: 498.

The authors reported 5 cases of multiple cysts of the renal pelvis that were incidentally discovered during routine investigation of the urinary tract by intravenous urography.

The pyelograms were characterized by the presence of numerous parenchymatous cavities, generally small, distributed on the tips of the calyces and the renal pyramids. They had a conformation that suggested a "bouquet de fleurs." These cavities were apparently inserted in the endorenal excretory passages. Their distribution was symmetrical and they involved the pyramids of the kidneys. In only 1 of the 5 cases was this condition found to be unilateral. This disease, which was so unique and characteristic from a roentgenological standpoint, also proved to be very interesting from an anatomicopathological point of view.

All the patients were adults who had symptoms of previous disease of the urinary tract.

The second patient had suffered from mild, recurrent attacks of cystitis that were followed by long symptom-free intervals for a number of years before this condition was discovered. Intravenous pyelography established the disease involving the kidneys in the second case. The first patient had a severe attack of enterocolitis followed by pyelonephritis a month before hospitalization. The third and fourth patients were hospitalized because of hematuria. The fifth patient, a woman 30 years of age, was hospitalized because of intense hematuria and right flank pain. Examination by intravenous pyelogram showed a normal left kidney and a characteristic "sponge kidney" on the right side. In this patient the right kidney was surgically removed and carefully studied.

The authors demonstrated from this nephrectomized kidney that the roentgenological picture was produced by a series of cysts distributed along the collecting tubules in such a way that the pyramids acquired a curious porous appearance. From the appearance of these multiple pyramidal cysts the term "sponge kidney" was chosen. The histologic study of the surgically removed kidney permitted a better understanding of the precise structure of these cysts. They were found to be of two types. In the first type they were irregular and covered by cylindrical epithelia. They were composed of large cells of highly colored protoplasm, which were considered to have embryonic characteristics. The intrarenal excretory ducts were found to be between the cysts. The cysts in the second type were spheroid, covered with flat epithelia, thin-walled, and contained seroalbumin. Some of the cysts consisted of the residuals of desquamated cells and calcareous granules. The tissue surrounding these cystic formations was in general rich in cellular elements, normal in appearance, and free from inflammatory processes or the pathologic residuals of inflammation.

After the exclusion of pyelonephritis as a course for this pyramidal cystic disease, or the secondary cystic development due to the sclerosis of the papillae and their tubular dilatation due to retention, the authors decided that the etiopathology of this disease was due to a dysembryogenesis.

Histopathologic study of the nephrectomized kidney along with the clinical history of these cases revealed that the disease was completely silent until a complication such as pyelonephritis, lithiasis, or hematuria focused the attention of the urologist on the urinary tract.

Cacchi and Ricci believed that the early recognition of this condition was important. The roentgenograms had a definite roentgenological appearance which was of diagnostic and prognostic value. This lesion was considered to be a stable and relatively benign one and did not appreciably reduce renal function. The task of the urologist was to recognize this condition and treat it effectively.

In conclusion, the authors recognized the fact that the clinical and roentgenological evidence of this disease must be supplemented by additional clinical, histologic and pathologic study before this disease can be properly classified.

CONRAD A. KUEHN, M.D.

Contribution to the Surgical Treatment of Serous Cyst of the Kidney (Contributo alla cura chirurgica delle cisti sierose del rene). GIORGIO RONCAGLI. *Urologia*, Treviso, 1949, 5: 456.

A 50 year old woman had suffered for 5 years with pains radiating from the right flank to the inguinal region. These pains appeared at 15 to 20 day intervals of complete well-being. Recently the crises had become worse with pains throughout the whole right half of the abdomen with nausea, vomiting, and febrile attacks.

Despite the paucity of physical and laboratory findings, a diagnosis of ptosis of the right kidney was made and operation was decided upon. The

kidney was disclosed through a right lumbar incision, and a solitary serous cyst, the size of an ostrich egg, was found attached to the anterior and internal border of the kidney. Puncture released the fluid contents of the cyst for laboratory study, and an attempt was made to find a line of cleavage between the cyst wall and the surrounding renal tissues. This was easily accomplished and the cyst was freed by blunt dissection and removed intact. Hemostasis was easily obtained, the convalescence was without incident, the healing was per primam, and the patient was dismissed 3 weeks later in perfect health.

Histologic examination of the excised specimen disclosed a cyst of evidently renal origin, as there were some renal tubules present in the capsule; this had been removed intracapsularly.

The liquid removed from the cyst by puncture exhibited the usual findings for this form of new growth. There was no urea, sugar, bile pigment, or hemoglobin. The author believes that the urea findings reported at times for the fluid contents of some of these cysts might be the result of a passage of the urea in the blood directly without intermediation of renal function. This would probably occur most profusely in very vascular structures.

The purpose in reporting this single case is to bring to the attention of the profession several interesting and significative findings in this patient. First is the unusual location of the cyst. It was attached to the anterior surface at about the middle portion of the kidney and directly to its concave medial border. The second interesting finding was the ease with which the line of cleavage was located. This characteristic has a direct repercussion on the method of treatment to be selected.

The author does not favor nephrectomy in these cases unless the kidney is infiltrated with numerous cysts, or unless the cyst has grown so large as to destroy most of the functioning tissues of the kidney. On the other hand, he does not like the various methods devised for partial removal of the cyst with marsupialization or chemical or electrocautery destruction of the epithelial lining of the part left behind.

It is also thought that the complete excision of the growth including a wedge-shaped portion of the kidney itself is too dangerous because of hemorrhage, and too apt to eventuate in a urinary fistula, requiring a later nephrectomy.

Of course, the author realizes that this single case could hardly be decisive of anything and that in this particular instance the line of cleavage may have been exceptionally well developed. However, despite the claims of other authors that such a line of cleavage does not exist, the author thinks that such a line may be present oftener than previously suspected and he urges all surgeons, when operating on these patients, to make an earnest effort to search for, and find such a line and to remove the cyst intracapsularly and intact.

JOHN W. BRENNAN, M.D.

Leucoplakia of the Renal Pelvis. CHARLTON P. ARMSTRONG, JR., HARRISON C. HARLIN, and CHESTER A. FORT. *J. Urol.*, Balt., 1950, 63: 208.

The authors add 1 case of leucoplakia of the renal pelvis to the literature, which, to date, contains reports on less than 75 cases of this condition. The formation of squamous cell hyperplasia in this region may be in the nature of a protective response by the transitional epithelium to resist chronic infection. Leucoplakia of the genitourinary tract is almost always preceded or accompanied by infection. Another explanation for the presence of ectodermally derived tissue in the renal pelvis, which is of mesodermal and entodermal origin, is the aberrant cell theory. The wolffian body, the forerunner of the ureter and pelvis, is closely associated with ectodermal cells. It has even been demonstrated that the pronephric portion of the wolffian body is derived from ectoderm. Cells separated from this primitive layer may distribute themselves aberrantly in the urinary tract.

The diagnosis of leucoplakia preoperatively is rare and is dependent upon the presence of a typical filling defect of the pelvis and calyces on pyelography, the finding of large, cornified, squamous epithelial cells on microscopic examination of the urine, and a history of infection. The condition is not necessarily precancerous, but it enhances the probability of malignant change. In the case recorded there was a history of intermittent treatment for urinary infections since the year of 1919. Retrograde studies showed distortion of the left kidney and pelvis. When the gross specimen was sectioned after removal, there were plaques of cornified tissue in the pelvis. Microscopically, there was marked squamous metaplasia with extreme, flaky, exfoliating cornification of the pelvis mucosa. There were multiple retention cysts of the renal parenchyma, some of which were lined by transitional epithelium undergoing squamous metaplasia.

In unilateral conditions, treatment is nephrectomy. In bilateral conditions, treatment is symptomatic, to control infection and provide drainage from the pelvis. ALLAN K. SWERSIE, M.D.

The Value of the Thoracoabdominal Incision in the Removal of Kidney Tumors. RICHARD CHUTE, LAMAR SOUTTER, and WALTER S. KERR, JR. *N. England J. M.*, 1949, 241: 951.

The authors have employed the thoracoabdominal approach in 39 urologic operations—in 20 cases for kidney tumors and in 12 cases for the exploration or removal (or both) of kidneys suspected of being cancerous but which proved to be benign. In 2 cases the thoracoabdominal route was utilized to allow nephrectomy, since the usual approach to the kidney was blocked by the ribs in kyphosis or scoliosis of the spine. In addition, by extending the lower end of the incision downward toward the pubis, it has been used for retroperitoneal dissection of the lymph nodes in the region of the kidney pedicle and along the aorta, vena cava, and iliac vessels.

It is the authors' opinion that the thoracoabdominal incision affords a much wider and better exposure of the kidney and its vascular pedicle than the extraperitoneal lumbar, or the transperitoneal, approach. This wide-open exposure confers the following advantages: greater ease and safety in securing the vessels of the renal pedicle; less manipulation of the kidney before the renal vessels are secured, thereby minimizing the probability of squeezing malignant tumor emboli into the blood stream; increased ability to remove all the perinephric fat and capsule of Gerota with the kidney; increased ability to remove large and extensive kidney tumors, some of which have been found inoperable by another approach; increased ability to remove the malignant extension of renal tumors to the inferior vena cava or to regional lymph nodes, thus constituting a more adequate operation for cancer (such extensions were removed en bloc with the kidney in several cases); and, by early ligation of the renal vascular pedicle, elimination to a large extent of the bothersome and often dangerous hemorrhage from large veins that run over the surface of some kidney tumors. Because the chest wound is held widely open by the rib retractor, less muscular relaxation is needed, and therefore less ether is used than when a comparable operation is performed through the abdominal musculature alone.

There was no operative mortality or death in the hospital, no pulmonary emboli, no chest or peritoneal infection, and only 2 complications, both due to intrapleural hemorrhage.

The thoracoabdominal incision is made possible by the development of intratracheal anesthesia with its ability to exert positive pressure upon the lung. It has conferred a wide-open approach by which renal neoplasms can be removed more easily and safely; even with the largest tumors encountered, the vessels of the pedicle have been fairly easily discovered, exposed, and ligated individually under direct vision. This has decreased the liability to such accidents as uncontrollable hemorrhage and injury to the vena cava, spleen, colon, or duodenum, which have occasionally occurred when the surgeon was working in cramped quarters in a deep wound with inadequate exposure and imperfect visualization of important structures.

In preparation for the operation of thoracoabdominal nephrectomy, particular attention is paid to increasing the hemoglobin and red cell count to normal. Older patients and all who have cardiac abnormalities are seen by a cardiologist, and most of these are put on a low salt diet; some are digitalized, and almost all are given preoperative quinidine. If the nephrectomy is to be on the left side, a Levine tube is placed in the stomach immediately before operation, to prevent gastric distention. Under intratracheal oxygen-ether anesthesia, the patient is placed on the operating table with the side to be operated upon uppermost. The incision starts about 1 cm. lateral to the spinous processes of the spine in back, and runs forward and downward over the entire course of the tenth (or eleventh) rib. When the end of the rib is reached, the incision is continued in the same direction across the abdominal wall as far as the lateral border of the rectus muscle. The incision is deepened through the muscle layers to the rib, which is removed in its entirety subperiosteally, being resected between its posterior angle and the spine. It is important to resect the rib as far back toward the spine as this, because, if it is resected farther forward, the ligaments binding it to the rib above and the rib below will prevent the optimum spread of the posterior angle of the wound, which is essential to the maximum possible exposure from this incision. The pleural cavity is entered through the periosteal bed, great care being taken not to injure the underlying lung. There is less chance of doing this if the pleural cavity is opened anteriorly over the diaphragm. The anesthetist is notified when the pleural cavity is entered. Unless adhesions are present, the lung collapses considerably on opening of the pleural cavity and retracts upward. If adhesions between the lung and the parietal pleura or the diaphragm are obvious and in the way, they are gently separated by sharp dissection, great care being taken to secure complete hemostasis with fine silk ties or ligatures. During the operation, the lung can be walled off by moist gauze, and the anesthetist may keep it almost completely re-expanded. By retracting the chest wall up and the diaphragm down, one can see the phrenic nerve as it courses downward over the pericardium; it may be crushed with a hemostat at the point where it leaves the surface of the pericardium to enter the diaphragm, or it may be injected with a few centimeters of 2 per cent procaine solution. The diaphragm is then incised in line with the skin incision, the incision also being carried through the peritoneum, which is adherent to its under surface. Care is taken not to cut into any organ that may be adherent to its under side, such as the kidney or the liver on the right side, and the spleen or colon on the left side. The incision in the diaphragm is carried forward through the decussation of the diaphragm with the transversus abdominis muscle and through the oblique muscles as far as the outer border of the rectus muscle, thus opening the peritoneal cavity widely. A Finochietto rib retractor is used to separate the ribs, and the kidney then bulges up into the wound. On the right side the liver also presents, but even if somewhat enlarged, it is easily retracted upward out of the way. On the left side, the spleen is packed off upward. The renal tumor, surrounded by its intact fatty capsule, is gently retracted laterally, the duodenum or colon is gently freed from its medial aspect, and the renal vein is easily exposed and may be dissected out cleanly. The dissection of the pedicle is then continued under direct vision, and when the main renal artery is exposed, the vein and the artery are individually clamped, sectioned, and doubly ligated, as well as any smaller vessels. In addition to the perinephric fat, all lymph nodes and areolar tissue in the region of the pedicle or

adherent to the great vessels are dissected away, being removed en bloc with the tumor, if possible. The ureter is sectioned, ligated, and carbolized. The kidney mobilization then is completed and the kidney is removed. A few stitches may be taken to cover the raw area with peritoneum and to fix the bowel back in position. Then the opening in the peritoneum is closed anteriorly as far back as the diaphragm with continuous plain No. 0 catgut. The diaphragm is sutured with interrupted stitches of heavy silk. Before the chest is closed, 1.5 c.c. of eucipine in oil is injected into the intercostal nerve of the rib resected, and also into the nerve of the rib above and below, inside the chest behind the angle of each rib; this prevents the voluntary splinting of the chest, as well as postoperative neuritic pain in the operative site. The pleura is reapproximated with interrupted silk sutures. The last two sutures are placed but not tied until the lung is completely re-expanded by the anesthetist with positive pressure. If the lung has been pricked, or there is oozing of blood, the chest is drained with a No. 22 F. 30 c.c. Foley catheter inserted through a tiny stab wound two interspaces above the incision in the axillary line; this catheter is connected to a three-bottle chest suction drainage at 8 cm. of negative pressure for 48 hours. About 1,000 c.c. of blood are given during the operation.

Postoperatively the patient is managed as a chest case. As indicated, quinidine, penicillin, digitalis, and streptomycin are administered. Nasal catheter administration of oxygen is given until aeration is complete. The Levine tube is attached to suction for a day or two. Morphine is given as necessary. The patient is up on the first postoperative day, and usually goes home on the tenth day.

DAVID ROSENBLOOM, M.D.

Experimental Study of Arterial Reactions with Reference to Certain Plastics (Estudio experimental de las reacciones arteriales frente a determinados plásticos). E VILLALOBOS MIER, J. M. BELTRÁN DE HEREDIA, and J. L. PUENTE DOMÍNGUEZ. *Angiologia*, 1949, 1: 337.

The femoral arteries of 30 dogs were wrapped intimately, but not tightly, with various types of plastic materials.

The material used in experiments on the first series of 10 dogs was polythene purissimo, while the second series of 10 dogs were wrapped with a purified cellophane, that is, nothing had been added to render the plastic material more pliable; in the third series of 10 dogs various types of commercial wrapping cellophane was used, even the cellophane wrappings of packages of well known cigarettes were employed.

A preliminary arteriographic examination was always done and this was followed at intervals by this same examination in order to follow up the healing in and subsequent progress. At intervals of from a few weeks to 8 months the animal was sacrificed and stained microscopic sections of the artery and enveloping layer of plastic material were prepared. These sections were always serial and in each case followed the entire section of the treated artery, from the inguinal to the popliteal region.

The polythene produced no effect; the pure cellophane produced no apparent effect on permeability characteristics of the artery, and not more than a thin involucrum of new connective tissue formation was found on microscopic examination. The commercial samples of cellophane, on the other hand, always produced a marked tissue reaction leading to a marked proliferation of the medial layer of the arterial wall, fragmentation of the elastica, and replacement of the interna by masses of new granulation tissue. The artery was always completely occluded; however, the process was slow, taking about 8 months, and there was always time for an adequate development of collateral circulation, so that in no instance did the animal's leg show any effects from ischemia.

The authors therefore ascribed the unfavorable effects of the commercial cellophane to the impurities contained, and wonder whether some of these impurities might not be carcinogenic. Further experiments are being carried on with this last idea in mind, and any positive results will be reported later.

JOHN W. BRENNAN, M.D.

BLADDER, URETHRA, AND PENIS

Cytometric Research on the Human Bladder Musculature with Reference to the Hypertrophy Resulting from Hindrance to Urination (Richerche citometriche sulla muscolature vescicale dell'uomo nell'ipertrofia da ostacolato deflusso urinario). PAOLO CAVAZZANA. *Urologia*, Treviso, 1949, 4: 351.

The material at the author's disposal at the University of Padua, Italy, was divided into 3 groups of 4 cadavers each.

The first group of cadavers had no history of urinary disease (normal controls), the second had a history of urinary disease but the bladders did not yet show any macroscopic effects from pressure, and the third group presented the typical trabeculated, or ribbed, bladder of chronic retention. All of these bodies were in the 60 to 70 year age group.

The bladders, which were treated as soon after death as possible, were filled with 250 c.c. of physiologic salt solution. This solution was progressively displaced by 10 per cent formalin solution, the bladder itself being coincidently perfused through the internal iliac artery with the same hardening fluid. The specimen to be examined was excised through the total thickness of the posterior bladder wall, always at the same distance (3 to 4 cm.) from the trigone. The stained microscopic sections were always from 6 to 12 micra in thickness.

In estimating the area of cross section of the individual smooth muscle cell (no attempt was made to measure the longitudinal diameter of these cells) the two diameters at right angles to each other were

measured in micra on the cross section and the area was calculated by mathematical formula. The numbers of each size of muscle cell were counted and registered in tables. Then from these tables three graphic curves were erected, the abscissas expressing the cell area in square micra and the alternates, the number of each size of cell per thousand counted.

The counts were made for each group and for each muscle layer of the bladder wall, that is, for the plexiform layer (stratum internum), for the circular layer (stratum medium), and for the external or longitudinal layer (stratum externum). A count was also made on the trabeculae themselves; these structures are, of course, made up of the plexiform muscle cells, although at times they contain some of the middle muscle layer also.

These graphs and tables show that in the normal bladder there is not much difference in the sizes of the cells for the different layers. In the bladders with initial hypertrophy the curve becomes more flattened and extended to the right, that is, there are present relatively fewer cells of the smaller size, and cells of notably larger sizes than those in the normal bladder. The other two curves (circular and longitudinal layers) were not notably altered from the normal. In the trabeculated bladders the curves for the plexiform and circular layers and the curve for the counts on the trabeculae exhibited a marked shift to the right, that is, in these sections the cells were much larger on the whole. The longitudinal layer did not differ markedly from the normal.

The circular, or middle, muscle layer was remarkable in that it exhibited two peaks to the curve as shown on the graph. The one elevation corresponded to its course in the cases of initial hypertrophy (not notably different from the normal), and the other peak, further over to the right, was included in the brackets for the larger cells. This suggests to the author that the second elevation might be an effect of this layer's contiguity and partial involvement in the composition of the trabeculae of the plexiform layer.

On the whole, the average increase in size of these smooth muscle cells (about 20 per cent) is not so great as that reported for the hypertrophied voluntary muscles and for the hypertrophied cardiac muscle. It is somewhat less than the figures for the human uterus during pregnancy.

JOHN W. BRENNAN, M.D.

Clinical Aspects of Neurogenic Bladder. GEORGE O. BAUMRUCKER. *Surg. Clin. N. America*, 1950, 30: 87.

The definition of the term "neurogenic bladder" is not clear-cut, and a profusion of terms has been used to describe the different degrees of nerve damage and bladder dysfunction. Usually, a syndrome of one or more of the following conditions is observed: (1) disturbance in the expelling force of the bladder; (2) decrease in the sensation of bladder fullness; (3) disturbed function of the external sphincter. The findings are attributed to some type of damage to the innervation to the bladder.

The outstanding finding in a neurogenic bladder is urinary retention, in the absence of bladder neck obstruction. There are three general types of neurogenic bladder:

1. *The atonic bladder* is due to peripheral nerve lesions, usually motor, as occurs in spina bifida occulta, peripheral neuritis, and injuries to the sacral or hypogastric plexus following surgery. Cystoscopically there is increased bladder capacity and decreased force of expulsion.

2. *Cord bladder* is the intermediate type associated with early lesions of the spinal cord. Urinary retention with or without incontinence occurs. It is seen in tabes dorsalis, toxic sclerosis of the cord, multiple sclerosis and other conditions. Cystoscopically there is relaxation of the internal sphincter and fine trabeculation. Sensation varies, early being hypersensitive and hypertonic.

3. *The paralyzed bladder* is seen in complete transection of the spinal cord. The condition may be due to trauma, tumors, hemorrhage, or infection. Cystoscopically there is complete atony and a tight external sphincter. After the initial shock of injury, an automatic bladder may develop in varying periods of time. Late, there may be a hypertrophic and spastic internal sphincter, necessitating surgery.

Clinically, postoperative abdominoperineal resection frequently causes a disturbance of urination. This is especially noted in those males who have had some preoperative urinary symptoms, since both carcinoma and prostatism occur in the same age group. The surgical injury is probably to the hypergastric nerve plexus, and there is the added factor of bladder neck obstruction. Treatment consists of resection of the bladder neck, care being taken not to allow the bladder to become overdistended due to too early removal of the catheter, postoperatively.

The bladder of poliomyelitis is not easily classified by this list. Clinical observation indicates that the acute edema in the spinal cord stimulates the sympathetic components, which causes inhibition of the detrusor and activation of the sphincter. As the edema subsides, the sphincter slowly relaxes and urination occurs, especially if the detrusor is encouraged with a parasympathetic stimulant such as prostigmine or furmethide.

Incomplete damage of the spinal cord pathways with functional disturbances of the micturition reflex is the cord type of neurogenic bladder. The changes are usually irreversible and care is directed toward relief or treatment of the symptoms. Transurethral resection is indicated in cases in which there is concomitant neck obstruction. Choline derivatives are only of temporary value.

Complete transection of the cord results, clinically, in the paralyzed bladder. Voiding occurs with spurting of urine through a tight external sphincter when the distention and bladder pressure become severe enough. Automaticity of the bladder is the desired end result. This is aided by an automatic irrigating system and the prevention of extreme dilatation of the bladder by use of a small retention catheter.

Urethral drainage is suggested over suprapubic drainage, and a minimum of 6 to 9 months must be allowed for the automatic cycle to develop.

A two-way clamp, allowing the patient to irrigate his own bladder by a tidal drainage, is described. Resection of the bladder neck has a definite role and periodic examination of the paralyzed bladder with a foroblique lens is necessary. An adjunct in diagnosis also suggested is cystometry. However, resection should not be freely used, and has been limited to those cases with definite indications of associated bladder neck obstructions.

For associated incontinence, a modified Cunningham clamp with a thick base of foam rubber has been used, both alone or in combination with a small latex urinal.

Since damage to the nerve tracts is irrevocable, the therapy is directed toward treatment of the symptoms themselves. Caution is advised against over-enthusiastic treatment.

NATHAN ROSENBLOOM, M.D.

Classification of Epithelial Tumors of the Bladder. C. E. DUKES and F. MASINA. *Brit. J. Urol.*, 1949, 21: 273.

In the days when only tiny fragments of bladder tumors were sent to the laboratory for examination, all the pathologist was expected to do was to try to decide whether the little bit of tissue was histologically benign or malignant. Now that surgeons adopt a broader attitude toward cancer of the bladder, the pathologist must expect to receive the entire lesion, possibly even the entire bladder.

The authors gained extensive experience with tumors of the bladder removed by partial or total cystectomy, and this led them to establish a method of examining operative specimens. Their classification of epithelial tumors of the bladder was based upon the following four features: (1) the gross characters of the tumor, (2) its histology, (3) the extent of spread, and (4) the condition of the remainder of the bladder.

OUTLINE FOR CLASSIFICATION OF EPITHELIAL TUMORS OF THE BLADDER

1. Gross characteristics of the tumor. First notice whether lesions are single or multiple. Then record size, shape, surface, surroundings, and (whenever possible) exact situation of lesions.

2. Histology of the tumor: (a) nonmalignant simple transitional cell papilloma, and (b) malignant papillary transitional cell carcinoma, solid (nonpapillary) transitional cell carcinoma, transitional cell carcinoma with metaplasia, pure squamous cell carcinoma, pure adenocarcinoma, and anaplastic spheroidal cell carcinoma simplex.

3. Estimate of extent of spread of the tumor: Stage 1, confined to bladder; no metastases; Stage 2, spread to paravesical fat or adjacent tissues but lymphatic glands free from metastases; Stage 3, metastases in paravesical or regional lymphatic glands; Stage 4, remote metastases known to be present.

4. Surroundings of the tumor. A careful inspection of the surrounding mucous membrane may reveal other tumors, suspicious nodules, patches of congestion or ulceration, diverticula, or trabeculae. Of special importance are nodules which may be of a neoplastic nature. Sections through the tumor margin or surrounding tissues may provide evidence of probable vascular or lymphatic spread.

The application of this classification is dependent upon the close collaboration between clinician and pathologist and on careful preparation of the operative specimen.

When an examination of the cystectomy specimen in the fresh state has been made, the hole in the bladder is repaired and the organ is distended with formalin. A medium bore needle is thrust obliquely through the bladder mucosa. The urethra is ligated, and when the bladder is water-tight, it is distended with 10 per cent formol saline solution until it is firmly stretched. The purpose of the distention is to stretch the bladder sufficiently to obliterate the mucosal folds and thus provide the best view of the bladder surface. After distention, the specimen is left in a bowl of formol saline solution for 2 or 3 days; then the bladder is opened, usually by sagittal division into two halves. This allows for visualization of the bladder and the relations of the tumor to the normal bladder mucosa.

A partial cystectomy specimen should be stretched and pinned out on a cork and reimmersed in 10 per cent formalin for 24 hours. Then the specimen is removed from the cork and reimmersed in 10 per cent formalin to allow satisfactory fixation of all its surfaces.

If during a cystotomy a pedicled tumor with its adjacent mucosa is removed, then it is necessary to pin out the mucosa on a piece of cork before it is fixed. By this method the physical characters such as the size, type of pedicle, and the state of the adjacent mucosa can be judged.

A complete diagnosis and classification of a bladder tumor should include a description of four features: (1) gross characters, (2) histology, (3) extent of spread, and (4) the condition of the surrounding mucosa.

To achieve the best results with this classification there should be close co-operation between the surgeon and the pathologist.

CONRAD A. KUEHN, M.D.

Papilloma of the Bladder. Life After Fulguration. HERMAN L. KRETSCHMER and EDWARD A. STIKA. *J. Am. M. Ass.*, 1949, 141: 1039.

One hundred cases in which the initial cystoscopic diagnosis was benign vesical papilloma were followed for a minimum of 5 years. There were 4 males to 1 female in this series and the ages of the patients varied from 20 to 76 years. No occupational hazards could be identified. Hematuria, usually painless, was the presenting symptom in 87 per cent of the patients. There were no predisposing tumors of the renal pelvis. The papillomas occurred most fre-

quently near the trigone and 55 per cent of the patients had multiple tumors in the bladder.

Only 10 per cent of the entire group developed carcinoma within 2 to 18 years after the original benign diagnosis. Of these 10 patients, 1 died of a coronary occlusion, 4 others died after 12 to 14 years, and 5 are living. All of these patients had more than one tumor when first examined.

Initial treatment of 95 of the 100 patients consisted of transurethral fulguration or resection, or both. In the other 5, open surgery was performed. Fifty-five patients required only one fulguration; the others had from 2 to 14 treatments.

Fifty-three patients are living and well. Their average survival since initial fulguration is 16.4 years.

The duration of life after the original fulguration of those who died was 12.7 years. There was no relationship between the cause of death and the presence of the papilloma. ORMOND S. CULP, M.D.

Contribution to the Surgical Treatment of Cancer of the Bladder. Total Cystectomy and Bilateral Implantation of the Ureters into the Rectosigmoid in a One-Stage Operation (Contribution au traitement chirurgical du cancer de la vessie. Cystectomie totale et implantation bilatérale des uretères dans le recto-sygmoide par voie sous-péritonéale dans le même temps opératoire). MARC NÉDÉLEC. *J. urol. méd., Par.*, 1949, 55: 520.

The author presents an operative technique for total cystectomy and subperitoneal bilateral transplantation of the ureters in a one-stage operation.

The operation in principle is the separation of the rectosigmoid from the general peritoneal cavity. The ureters are transplanted into the rectosigmoid in the usual manner, and then the rectosigmoid is covered by a fold of peritoneum. The removal of the bladder can be done before the transplantation of the ureters or after the ureters are placed in the bowel, whichever procedure is easier for the surgeon in the individual operation.

The first step in the operation is a transverse incision in the reflected peritoneum over the dome of the bladder. The incision is carried transversely from the middle of the bladder laterally on both right and left side until the great vessels of the pelvis are reached. At each lateral side a suture marks the extremity of the incision. These sutures are left long as they will be used to complete the closure of the peritoneum at the end of the operation.

After the transverse incision is made, the bladder is retracted toward the symphysis, and an elliptical incision at the base of the bladder is made. This incision runs below and parallel to the first one. With curved scissors, the peritoneum is freed from the bladder except for the "adherent zone" where the bladder and the peritoneum are frequently fused together. The lower fold of the peritoneum is dissected free from the bladder as the bladder is retracted toward the symphysis and out of the field of dissection. This procedure frees the fold of peritoneum that previously covered the bladder down to the pouch of Douglas so that it is ready for future use.

The anterior fold of peritoneum is sutured to the posterior fold of peritoneum over the promontory of the sacrum. This is done by uniting the two peritoneal folds with interrupted sutures. Thus, the rectosigmoid is separated from the general abdominal and peritoneal cavity.

The ureters are isolated at the base of the bladder at the crossing of the vasa deferentia. The vasa deferentia are ligated and cut between the two ligatures. This procedure allows for further dissection and elevation of the ureters. The ureters are then divided as close to the base of the bladder as possible.

A small buttonhole incision is made in the posterior layer of the peritoneum, and the ureters are brought through the small incision in close relation to the intended site of insertion into the rectum. As much of the periureteral tissues and the blood supply of the ureters as possible is preserved during this procedure.

The insertion of the ureters into the rectum is done in the usual manner, according to the particular choice of the surgeon.

At this stage the bladder can be removed, or this step can be deferred until after the rectosigmoid is covered by attaching the rectovesical layer of peritoneum to the prevesical peritoneal layer. The covering of the rectosigmoid and the area of the ureteral transplantation is brought about by making an incision that bisects the rectovesical peritoneum down to the pouch of Douglas. This procedure permits a T type of closure. In this manner the rectovesical layer of peritoneum is united to the peritoneum over the promontory of the sacrum. The rectosigmoid and the ureters are thus separated from the pelvis and covered with peritoneum.

In résumé, the author states that his method of bilateral ureteral transplant and cystectomy in one stage is a relatively simple operation, and because of the ease with which this operation is accomplished, more patients are able to withstand cystectomy for cancer of the bladder. The main features of the operation are the separation of the abdominal cavity from the site of the ureteral anastomosis into the rectosigmoid, and the covering of this anastomosis by peritoneum. In this way, the risks of immediate and secondary peritonitis by extravasation of urine and fistulization are reduced. This operative procedure can be done in one stage, and it is readily applicable to the female patient. Finally, the extraperitoneal transplantation of the ureters also permits an optimum length of ureter to be made available for the rectal anastomosis. CONRAD A. KUEHN, M.D.

Preliminary Communication on the Intracavitary Irradiation of the Bladder Mucosa by Radioactive Isotope Solution. D. M. WALLACE, R. J. WALTON, and W. K. SINCLAIR. *Brit. J. Urol.*, 1949, 21: 357.

The predisposition of bladder mucosa to undergo changes of a papillomatous or carcinomatous nature over a wide area, or changes arising from multiple

foci has been well recognized for many years. The small, multiple, sessile lesions arising from abnormal mucosa and involving a considerable area of the bladder wall have always presented a problem which so far has no easy solution.

The use of a short-lived radioactive isotope presented certain therapeutic advantages, particularly with regard to safety, ease of introduction, and duration of treatment over other forms of therapy. Radioactive sodium (Na^{24}) has been used for this particular purpose at the Royal Cancer Hospital. The selection of cases and the techniques of treatment were described by the authors in this preliminary communication.

The selection of cases was based on the conception that an unhealthy bladder mucosa could give rise to multiple lesions that were still confined to the mucosa or submucosa and lesions that had not as yet infiltrated the bladder muscle.

Sodium in the form of the isotope, Na^{24}, has a relatively short life. Consequently, any apparatus contaminated by it would become safe within a few days. This substance was considered to be nontoxic should it be absorbed from the bladder. Its radioactivity in the body was unlikely to produce any harmful results.

In the cases treated, gamma ray doses of from 2,000 to 3,000 roentgens were delivered to the bladder mucosa. The maximum dose which was delivered in one irradiation was 3,200 roentgen units. This treatment resulted in a marked bladder reaction and probably represented the maximum dose that was desirable in one treatment.

The original catheter was based on many modifications of the Foley catheter. Thick rubber balloons were used because, for practical purposes, they were impermeable to the solution used. The tip of the catheter was made flush with the surface of the balloon, so that when the balloon was distended, the eye for drainage of the urine was set as close to the proximal end of the balloon as possible.

The balloon was constructed of best quality latex rubber and could be distended so that it would contain 600 c.c. of the solution.

The insertion of the catheter was relatively simple in females. The urethra was dilated to No. 30 F., and the catheter, on a stilette, was introduced and stitched into place. In males, however, it was found impossible to introduce the catheter-balloon through the intact urethra. The balloon was introduced through a formal perineal urethrotomy. After the catheter introduction, the perineal urethrotomy was closed with stitches partially tied. After the catheter was removed at the completion of the treatment, the stitches were tied, which provided a water-tight incision.

When the treatment was a matter of only 1 hour or 2, the balloon was directly filled. The length of treatment and the treatment of an unconscious patient depended largely upon the bladder tolerance. An intolerant bladder that would barely hold 150 c.c. of the solution was best treated by short periods of exposure under anesthesia, although with the assistance of analgesics the uninfected case would usually stand a period of exposure of 4 or 5 hours.

The filling apparatus consisted of a 200 ml. flask with a two-way tap at the top and bottom. The upper tap could be used to connect the flask to a water (suction) pump or to a hand-operated rubber (pressure) bulb. The lower tap could be connected to the container of the isotope solution or directly to the catheter.

The patient was wheeled to the isotope laboratory, and the catheter-balloon was connected to the filling apparatus. The radioactive solution was delivered to the bladder. The bag was slowly filled, customarily to 150 ml. of radioactive solution. After the balloon had been filled, the catheter was disconnected and the patient was returned to a single ward. At the completion of treatment, the patient was again connected to the apparatus and the radioactive solution was removed from the bladder by suction. When the balloon was emptied, the catheter was withdrawn, and in the case of the male, the urethrotomy stitches were tied.

Of the 10 patients treated by this method, all showed some evidence of tumor regression. In 7 of the cases there was no evidence of a mucosal neoplastic lesion following treatment. One case showed only symptomatic relief without cystoscopic confirmation of tumor regression. One patient was subjected to a subsequent partial cystectomy for a residual lesion at the fundus; before the radioactive treatment there was an actively growing carcinoma, while afterward here and there the vesical mucosa contained viable microscopic foci of atypical nonviable cells which were "possibly carcinomatous." The third patient was found to have a small residual lesion at the end of 2 months, and the patient was given a second treatment. The reaction of the bladder to the second treatment had not subsided at this writing, so that the ultimate results were as yet unknown.

The authors concluded that it was too early to make any claims for this form of therapy, but that the results were sufficiently interesting to continue with the technique described in order to ascertain the optimum dose of radio active isotope (Na^{24}) in the treatment of multiple bladder lesions, and whether the fractional or single dose therapy was the more effective. CONRAD A. KUEHN, M.D.

Substitution of the Urinary Bladder with an Isolated Segment of Sigmoid Colon. J. DEWEY BISGARD and H. HARPER KERR. *Arch. Surg.*, 1949, 59: 588.

An operation is described, in which a segment of the sigmoid is used to replace the urinary bladder.

The first stage of the operation consisted of implantation of the right ureter into the sigmoid by the Coffey III technique. At 4 or 5 centimeters above this point the sigmoid was divided between clamps with a cautery. The distal end was closed aseptically with two rows of sutures and dropped into the

pelvis. The proximal end was brought out through the wound as a temporary colostomy.

From the tenth to the fourteenth postoperative day the distal segment was irrigated with saline solution.

At the second stage of the operation, on the fourteenth postoperative day, the bladder was removed and a small mushroom catheter was threaded through the urethra from within out. The distal sigmoid was then divided 4 to 6 centimeters distal to the site of the previous ureteral implantation. The head of the mushroom catheter was then inserted into the lumen of the isolated segment of sigmoid and secured in place with a purse-string suture placed 1 centimeter above the free edge. By traction on the catheter the sigmoid was then drawn down to the cut edge of the urethra and fixed to the latter with interrupted mattress sutures.

The left ureter was then implanted into the isolated segment. The continuity of the bowel was re-established by freeing the colostomized end of the sigmoid and anastomosing it with the distal segment.

The operation was performed successfully in 5 dogs, and in each case the substitute bladder functioned satisfactorily. In no instance was there evidence of infection of the urinary tract.

FREDERICK A. LLOYD, M.D.

The Treatment of Hypospadias (Tratamiento del hipospadias). L. A. SURRACO. *Prensa méd. argent.*, 1949, 36: 1428.

The author describes a treatment for hypospadias under the name of "bag procedure" which treatment is fundamentally applicable to the balanopenian type of this condition. The outstanding details are as follows:

1. Building up of a bag with superficial tissues, which will form the new urethra.

2. Tunnelization of the glans and sliding of the skin bag within this new canal. In this way a new meatus is obtained on the tip of the glans.

3. The paraurethral canals, frequently observed in this type of hypospadias, are then treated in a complementary stage. In addition, the redressement of the penis is undertaken by removal of the chordee.

In perineoscrotal hypospadias the same procedure is applied, but it is accomplished in two stages:

1. Transformation of this hypospadias into a balanopenian type by the building of a skin bag.

2. After a few months the procedure previously described is undertaken to treat the balanopenian hypospadias, with tunnelization of the glans. Regarding the perineoscrotal type of hypospadias, especially when the opening in the urethra is located very posteriorly, the necessity of derivation of the urine through a hypogastric cystostomy is stressed.

HECTOR MARINO, M.D.

Primary Carcinoma of Penile Urethra. N. F. KIRKMAN. *Brit. J. Surg.*, 1949, 37: 162.

The author presents an interesting case of primary carcinoma of penile urethra in which it was demonstrated that rapidly spreading carcinoma of the urethra can be eradicated surgically, with success, when too far advanced for irradiation. To date, only 6 other similar cases have been recorded in the literature.

In the author's case it was shown how carcinoma of the urethra mimics urethral stricture and its complications. This mimicry is apt to lead to delay in diagnosis. In this case, and in many recorded cases, the first indication of the presence of a cancerous lesion has been the finding of a necrotic or gelatinous mass on incising a urethral swelling instead of pus, as was expected. In the first stage a urethral stricture is simulated; when a tumor appears associated with obstruction, a periurethral abscess is suggested; and later, when fistulas are added, the appearance is that of suppurative periurethritis with fistulas. Most patients have required two operations before a diagnosis was established—the second one including a biopsy.

Pain in carcinoma of the urethra is frequently severe; it occurs spontaneously and is increased during micturition. Free bleeding may occur without obvious cause and these two signs, pain and bleeding per urethram with a penile swelling, are suggestive of carcinoma in the urethra.

Carcinomas of the urethra are most commonly squamous-celled; much more rarely they are papillary or transitional-celled. The squamous type may arise from metaplasia of the urethral mucosa, which is mostly columnar. In many cases metastases occur late in the course of the disease.

Metastases spread through the lymphatics to the deep inguinal glands and on to the external iliac and hypogastric glands. Although some of these cells pass there via the deep subinguinal glands, others go in lymphatics which run with the vessels to the bulb and internal pudic vessels, and so pass directly to the intrapelvic glands.

Besides lymphatic spread, metastasis occurs in the corpora cavernosa.

In most cases the late diagnosis makes irradiation ineffective, although in early cases it would seem ideal if combined with a suprapubic cystotomy. In all cases a preliminary cystotomy is valuable as a means of reducing sepsis by preventing urine from contaminating the operative area. In most cases of carcinoma of the penile urethra, treated surgically, a partial or total removal of the penis is carried out, and usually a block dissection of the glands in the groin. Carcinoma of the bulbous part penile urethra is rarely diagnosed early enough for a radical operation.

In cases in which the radical operation is performed, it seems better, for physiological reasons as well as for anatomical convenience, to remove the testicles and scrotum, although some American authors do not advise this.

Prognosis is better for carcinoma in the anterior urethra than in the posterior urethra, as would be expected from its more obvious and accessible position.

ROBERT TURELL, M.D.

GENITAL ORGANS

Ischemic Infarction of the Prostate Gland. H. Haynes Baird, Hamilton W. McKay, and Paul Kimmelstiel. *South. M. J.*, 1950, 43: 234.

Ischemic infarction of the prostate gland, although a common lesion, was not described until 1933, when Abeshouse recorded the first 3 cases. Since that time 30 cases have been reported in the literature. Moore has stated that the lesion occurs in at least 25 per cent of all hyperplastic prostate glands. The authors studied 352 prostate glands, which were enucleated surgically between 1941 and 1949, and found ischemic infarction in 66, or 18.7 per cent.

The authors analyzed the clinical aspects of the cases with this lesion and believe that, contrary to common opinion, this lesion does not contribute to the incidence of acute retention or gross hematuria. The cause of the infarcts is unknown, but they are thought to be related to the degree and rate of growth of the hyperplastic process.

Grossly, the lesion varies from a few millimeters to from 2 to 5 cm. in diameter. It is an area of coagulation necrosis which involves the epithelium, muscle, and connective tissue. There are associated scattered areas of hemorrhage. The lesion is yellowish or mottled yellowish gray, is surrounded by a hemorrhagic margin, and occurs only in a hyperplastic gland. On microscopic examination a peculiar change in the glandular epithelium is found in the marginal zone, extending for some distance into the seemingly uninvolved prostatic tissue. This process has been referred to as epithelial metaplasia and dysplasia.

The authors gave a detailed explanation and description of this pathologic entity, with especial reference to the epithelial metaplasia and dysplasia which occurs. It is pointed out that the lesion can be easily mistaken for carcinoma if the pathologist is not well acquainted with this condition. Photomicrographs of typical sections of the lesion are included.

John L. Emmett, M.D.

Torsion of the Spermatic Cord. Sam Peck. *Tr. West. Sect. Am. Urol. Ass.*, 1950, 16: 16.

Torsion of the spermatic cord must be considered in the investigation of any acute pathologic condition of the scrotum or groin, but it may even occur with an intra-abdominal testis, producing severe pain in the lower portion of the abdomen. The most common conditions from which it must be differentiated are: (1) acute epididymitis in which there may be a history of urethritis, the finding of objective evidence of infection in the genitourinary tract and a thickened palpable epididymis located posterior to the testicle; (2) strangulated inguinal hernia; (3) acute hydrocele, usually less painful and easily transilluminated; (4) acute orchitis; (5) tumor of the testis which occasionally has an acute onset; (6) suppurative inguinal adenitis; and (7) torsion of the appendix testis (hydatid of Morgagni).

From a clinical point of view there are three types, namely, acute, chronic, and recurring. Anatomically, two varieties are recognized: (1) intravaginal (within the tunica vaginalis), and (2) extravaginal. The latter variety is rare.

The author included a list of possible predisposing causes, most important of which are hypermobility of the testis, a large roomy tunica vaginalis, and faulty development or absence of the mesorchium. As for exciting causes, he suggested any movement of the patient which induces strong contraction of the cremasteric muscle.

Symptoms consist of sudden, acute pain associated with nausea, vomiting, and mild shock. Examination usually discloses a swollen testis and epididymis with some redness and edema of the scrotal skin, and the epididymis is often lying anteriorly. The thigh may be flexed upon the abdomen.

Immediate operation is the only treatment. Usually it is performed too late to save the testis. The author reported 6 cases, in 5 of which operation was done. Only 1 of the 5 was of the extravaginal type. Orchectomy was necessary in 3 cases. In 1 case in which the testis was saved, atrophy occurred later.

John L. Emmett, M.D.

MISCELLANEOUS

The Clinical Management of Cystine Lithiasis. Linwood D. Keyser and Charles D. Smith. *J. Urol.*, Balt., 1949, 62: 807.

After a comprehensive review, attention is directed to the fact that cystinuria is an inborn error in metabolism. The oxidation of sulfur-containing protein is disturbed so that cystine is not oxidized to inorganic sulfate but is excreted unchanged. Cystinuria is a permanent physiologic disturbance; the condition occurs in about 1 patient in every 11,000 to 12,000 and has a definite hereditary tendency.

Cystine calculi are found in only 3 to 4 per cent of cystinuric individuals. Such stones may form in acid, neutral, or slightly alkaline urine, and may vary in opacity; they recur almost inevitably and seem to form on previously injured renal epithelium.

A special technique for localizing faint shadows in the renal pelvis is described. Treatment is essentially the same as for any type of calculi but may be governed somewhat by the extremely high incidence of recurrence.

The prophylactic regimen advocated by the authors consists of (1) urinary alkalization with drugs and an alkaline ash diet, and (2) periodic ureteral dilatation and lavage of the renal pelvis with weak alkalies. The results have been most gratifying.

Four case reports are included. These also illustrate a special method of dilating the ureter below an impacted calculus which has been followed by spontaneous passage of calculi.

Ormond S. Culp, M.D.

The Antibiotics in Urology. Charles A. Wells. *Brit. J. Urol.*, 1949, 21: 302.

The cost of inexperience in the use of streptomycin was thought by the author to be a real item which

the Americans were bearing, and only time would show how big the expense might be. It might be measured, as to the pence, in deafness and vertigo, but no one yet knew how it may need to be measured as to pounds in the establishment of resistant strains of bacteria. If the careless use of streptomycin were to lead to the widespread propagation of resistant strains of only Bacillus pyocyaneus and Bacillus tuberculosis, the results might well prove to be disastrous. Unfortunately, such a disaster could not be confined to any one country or continent and all nations would have to share in its effects. It was clear to the author that the avoidance of the production of resistant strains must ever be in the front of our minds when using streptomycin.

Wells considered the following rules for the use of streptomycin in urology:

1. The first rule is to use all other remedies at our disposal before streptomycin is used. The full range of sulfonamides and penicillin in large doses should be used before streptomycin therapy is instituted. The therapeutic value of a low *p*H and, in particular, of mandelic acid and its forerunner, the ketogenic diet, should receive therapeutic consideration.

2. The second rule is to decide that the residual infection, resistant to other agents, is of such a nature that every effort must be made to eliminate it and that delay is more dangerous than streptomycin.

3. The third rule is that every possible effort should be made to complete surgical treatment before streptomycin is prescribed. The resistance of the organisms to streptomycin, so far as is known, endures indefinitely and persists with the organism in its spread to other lesions and other patients. Residual urine and calculi may similarly provoke a relapse with conversion to a resistant strain.

4. The fourth rule is that the dose given should be immediately effective. This is not difficult in the case of urinary infection since the antibiotic is freely excreted in the urine. An adequate level is reached and maintained on 1 gm., 1.5 gm., and 2 gm. daily of streptomycin in divided doses. Sensitive organisms disappear within a few hours and resistance is established within 3 days. A course lasting 3 days is therefore as likely as any to provoke an effective cure. A longer course is not more likely to do any good, but could needlessly provoke resistant strains.

5. The fifth rule is that in vitro tests should be tried before prescribing streptomycin so as to avoid the provocation of resistant strains of organisms without likely benefit. There is, however, general agreement that in vitro tests are not infallible and that as the last resort streptomycin could reasonably be tried and might prove successful when these tests seemed to contraindicate its use.

6. An exception to all the above rules should be made in cases of extreme emergency due to infective states in the urinary tract when some desperate remedy is needed for a desperately ill patient. Dramatic improvement might follow and could afford an opportunity for intervention. The necessity of operative procedures should then be carried out without delay since relapse, with or without resistant strains, is likely and a second opportunity might not occur again.

Most British urologists agreed with the advice issued from the Ministry of Health that streptomycin may be given to patients who presented:

1. Very early lesions, unilateral or bilateral, when demonstrable by pyelography.

2. Residual lesions in the bladder or remaining kidney after nephrectomy for supposed unilateral disease.

3. Bilateral lesions.

4. Tuberculous cystitis in which the responsible kidney cannot be identified.

In the above rules for the treatment of tuberculosis the implication was that in the average unilateral case early nephrectomy still offered the best chance of relief and probable cure.

Epididymitis seemed not to respond very well, though sinuses apparently healed well in the genitourinary tract, as elsewhere, but epididymectomy was so satisfactory an operation that it should be performed without hesitation.

The author states that in the use of streptomycin in tuberculous infections, the same general principle applies as in nontuberculous infections; namely, that surgery should always be carried as far as possible before streptomycin therapy is begun.

CONRAD A. KUEHN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Malignant Degeneration of Benign Giant Cell Tumor of Bone. T. LEUCUTIA and JAMES C. COOK. *Am. J. Roentg.*, 1949, 62: 685.

Several articles which state that roentgen therapy is hazardous in benign giant cell tumor of bone have lately appeared in the literature. The main argument for this lies in the fact that it is continually being observed that osteogenic sarcoma arises many years after irradiation at the site of the successfully treated giant cell tumor, often with fatal results.

The authors studied the various possibilities leading to malignant transformation of benign giant cell tumor of bone, and analyzed the relative incidence of such transformation when different methods of treatment were used. The literature was reviewed *in extenso* and an attempt was made to correlate the controversial findings. In discussing the effect of the roentgen rays a sharp distinction was made between the cases in which gross over-irradiation occurred and those in which the customary technique was used. The authors' experience was based on a series of 77 cases of giant cell tumor of bone, treated at Harper Hospital, Detroit, from 1923 to 1947, inclusive. In the early cases the treatment consisted of curettage and postoperative roentgen therapy, but since 1930 roentgen therapy alone has been used in nearly all cases.

In the entire series, 5 of the patients are known to be dead, 3 from incidental disease and 2 from sarcomatous transformation of the apparently benign giant cell tumor. Five are untraced; 1 of these had a malignant degeneration of the benign giant cell tumor and is, therefore, assumed to be dead. In an additional 4 patients a sarcomatous change of the benign giant cell tumor developed, but after further treatment, either by surgery or irradiation, a satisfactory final result was obtained.

Thus, the number of patients showing malignant transformation was 7 of 77, or approximately 9 per cent. All of the cases are presented in considerable detail. Roentgenograms in various stages of the disease and photomicrographs of histologic sections made before and after the malignant degeneration are illustrated. In 4 of the cases the malignant degeneration occurred when roentgen therapy was used; in 1 case it was spontaneous; in 2 cases it followed surgical procedures. An eighth case is included, in which fibrosarcoma of the soft tissues and sternum developed 18 years after gross over-irradiation for enlargement of the thymic gland.

A study of the literature and an analysis of the enumerated cases show that malignant degeneration of a benign giant cell tumor can occur (1) spontaneously, when no treatment is given; (2) following repeated surgery and irradiation in various forms; (3) when roentgen therapy alone is used; and (4) following surgery alone when bone chips are used to fill the bone cavity.

Therefore the conclusion is drawn that the malignant transformation of the benign giant cell tumor of bone constitutes, in from 10 to 15 per cent of the cases, a natural sequence of events which is unaffected by the type of treatment given.

Intra-Articular Lesions Caused by Fat Pad Hypertrophy. JAMES K. STACK and STEPHEN CHASTEN. *Am. J. Surg.*, 1949, 78: 570.

Since Hoffa's article in 1904, little has been written about fat pad hypertrophy and its place in the differential diagnosis of internal derangements of the knee. Not infrequently, arthrotomy fails to demonstrate the anticipated meniscal tear, but the patient's symptoms are relieved. To expose the meniscus adequately, most of the fat pad has to be excised, which prevents further intrusions of fat pad projections into the joint.

The authors believe from microscopic study of many sections that this tissue is not a lipoma but an inflammatory hyperplasia. Repeated small traumas, as well as a single violence, may rupture the thin synovial membrane and allow subsynovial fat to intrude upon and damage cartilaginous surfaces. The presence of the fat pad is constant in the human knee, but its size and shape vary greatly. It is infra-articular but normally extrasynovial and attached to the deep surface of the patellar tendon. The tonguelike projections on the articular side vary greatly in size and are relatively free.

Fourteen cases of knee joint derangement in which the lesion was in the fat pad are presented. In 9 patients there was intermittent recurrence of pain, locking, and effusion. In these cases there was femorotibial intrusion of the pad with cartilaginous erosions. Two cases followed torsion violence and presented fat pad intrusion but no articular cartilage lesions. Two cases resembled the "aborescent lipoma" type of hypertrophy producing severe changes in the patella and underlying femoral surface. One patient presented a fat pat bulging anteriorly to resemble a ganglion of the patellar tendon.

Trauma is a distinct factor in producing this lesion, which can only be proved by surgical inspection immediately after the meniscotomy incision is made. Intruding fat pad projections may appear flattened, grayish, or hemorrhagic, and usually the point of contact on articular cartilage will be eroded.

Microscopic study shows chronic inflammatory change with fibrosis. It is not easy to make a definite diagnosis preoperatively, although minor impingements will respond to simple rest and heat. In doing an arthrotomy for internal derangement of the knee, it is important to study the fat pad carefully.

FRANCES E. BRENNECKE, M.D.

Rhabdomyosarcoma of Skeletal Muscle. PETER CHILDS. *Brit. J. Surg.*, 1949, 37: 230.

The rarity of rhabdomyosarcomas prompts this report of 2 cases seen at King's College Hospital. Stout (1946) found 107 previously published cases and added 14 of his own.

Case 1 was that of a woman 72 years of age who had progressive numbness, swelling, pain, and edema of the right calf for 8 months. The mass was confined to the area of the medial head of the gastrocnemius. Regional lymph nodes were normal. Roentgenograms of the leg showed the soft tissue mass, but no bone involvement; those of the chest were negative for secondary deposits.

The tumor had a sarcomatous appearance at surgery and a midthigh amputation was performed. The specimen showed a tumor 10 cm. in diameter which involved the medial head of the gastrocnemius. It was partially encapsulated, but small nodules were found in the surrounding muscle. The popliteal lymph nodes were not involved. Sections showed a highly cellular tumor composed of fusiform cells, among which were scattered large, irregularly-shaped giant cells. With Heidenhain's iron hematoxylin stain, longitudinal and cross striations were seen in some of the tumor cells. In one section clear transition was seen at the periphery of the tumor from normal muscle to neoplastic tissue. This woman was well 1 year later.

Case 2 was that of a woman aged 62. Two years previously she had undergone a right local mastectomy for a cystic mass attached to the skin and deep structures. No tissue was available for study and diagnosis. At examination a mass 1 inch in diameter, and free from the skin and deep tissues, was found in the operative scar. This mass was widely removed with the skin. The specimen consisted of an irregular mass of firm tissue 3 by 2 by 1 cm. Sections showed the tumor to have all the histological characteristics of a rhabdomyosarcoma. Its origin from a small plaque of normal muscle, included in the specimen removed, can be clearly seen. Six months later the patient was apparently well, with no recurrences.

A review of the literature regarding the genesis of the tumor is presented. This can be summarized briefly as follows:

1. Benign granular-cell myoblastoma is thought by some to be a neoplasm, by others to be a reaction to injury or inflammation. No striation can be observed in the cells of this structure. The cells are large, with a granular, acidophilic cytoplasm, and they are packed together in solid masses without connective tissue fibers between the individual cells.
2. Rhabdomyoma is a true tumor of stri ted muscle in which cross striation can be demonstrated.
3. Rhabdomyosarcoma is a malignant tumor of striated muscle, including the form called by some "malignant cell myoblastoma."

In the discussion, the author comments on the advanced ages of his patients as compared with the ages of patients in other reported cases. Apparently neither of his patients had lymphatic or hematogenous spread. Local invasiveness was demonstrated in case 1. Radical removal of the tumor is the ideal treatment. KENATH H. SPONSEL, M.D.

Pronation Injuries of the Forearm with Special Reference to the Anterior Monteggia Fracture. E. MERVYN EVANS. *J. Bone Surg.*, 1949, 31-B: 578.

Theoretically, pronation injuries of the forearm or anterior Monteggia fractures consist of (1) fracture of the ulna in its middle third, with backward angulatory deformity and anterior dislocation of the head of the radius; (2) fracture of the ulna in its middle third, with a high fracture of the shaft of the radius; (3) anterior dislocation of the head of the radius without fracture of the ulna.

The author is of the opinion that this fracture is produced by falling on the outstretched hand with the arm well pronated, and not as a result of direct impact on back of the forearm. The paucity of external bruises to the skin, compound injuries, and relative absence of comminuted fractures confirms his convictions.

Experimentally, the author subjected 18 forearms between a wooden clamp and vise to determine the mechanism of anterior Monteggia fracture. In 12 specimens he obtained a fracture of the middle third of the ulna, and anterior dislocation of the head of its radius. Miscellaneous results were obtained in the remaining 6 cases.

Eleven cases of Monteggia fractures were studied in this report. The treatment pursued by the author was that of placing the patient under deep anesthesia, pronation of the forearm, and manipulation of the head of the radius with plaster of paris immobilization. Two of the patients in this series had to be operated upon for (1) late treatment and (2) epiphyseal separation.

In 10 of the 11 cases a normal range of motion was attained. Poor function was encountered in the avulsed radial epiphysis.

SAMUEL L. GOVERNALE, M.D.

The Modification of Perthes' Plastic Operation in Radial Nerve Paralysis (Modifikation der Perthesplastik bei Radialislaehmung). LUDWIG GUENTHER VOGT. *Chirurg*, 1949, 20: 534.

In permanent paralysis or failure of suture of the radial nerve, Perthes' operation fixes the hand at least elastically in dorsal flexion at the wrist, allowing it to serve again as a grasping organ but without fine control. Unfortunately, fixation of the hand in dorsal flexion is extremely troublesome for many activities, and therefore, Vogt decided to use the flexors of the wrist to move the extensor apparatus of the hand, taking care to lead the transplanted tendons and their muscles gradually to the dorsal aspect so that they may exercise a nearly straight pull on the tendons to which they will be attached.

Under local anesthesia and through buttonhole incisions, the tendon of the flexor carpi ulnaris is cut close to the pisiform bone, and the tendon of the

flexor carpi radialis is cut as far distally as possible at the level of the navicular bone, and both tendons are provided with a suture. Then, under evipan narcosis and the use of a blood pressure cuff for hemostasis, an incision 5 cm. long is made over the muscle belly of the two flexors of the wrist, and these muscles with their cut tendons are pulled out of their distal compartment, care being taken to respect their nerves and blood vessels. Recognition of the muscles is facilitated by pulling on the suture which was passed through the tendons. The extensor tendon apparatus is then exposed by a longitudinal incision, 5 cm. in length, over the wrist, and with a forceps the skin is undermined obliquely outward on both sides in the directions of the incisions made on the flexor aspect. The flexor tendons are pulled into the new canals and the incisions on the forearm are closed. In the meantime, the hand is held in slight dorsal flexion by an assistant. The tendon of the flexor carpi ulnaris is now braided with the extensor tendons of the second to fifth fingers and fixed with silk sutures. The tendons of the abductor pollicis longus, extensor pollicis longus, and brevis are exposed through the same incision and sutured to the tendon of the flexor carpi radialis. The wound is closed and a plaster cast is applied. After 3 to 4 weeks the cast is reduced to a gutter splint, and reeducation of the muscles is started by attempts at active movements with the simultaneous help of the faradic current. The cast is completely removed after 5 to 6 weeks. The result is restoration of all normal movements of the hand which gradually regains its former strength. RICHARD KEMEL, M.D.

A Case of Rupture of Flexor Tendons Secondary to Kienboeck's Disease. J. I. P. JAMES. *J. Bone Surg.*, 1949, 31-B: 521.

An unusual case of rupture of the flexor tendons at the wrist is presented. A 50 year old motor driver complained of pain in front of the left wrist, of 9 years' duration. There was no history of injury. Four months before he was examined he was unable to flex the distal joint of the index finger. Three months later there was sudden cramping and pain in the hand, after which he was unable to flex the interphalangeal joint of the thumb. Examination revealed, in addition, soft tissue swelling in front of the wrist, and proximal to this some hollowing of the radial half of the volar surface of the forearm. Dorsiflexion and radial abduction of the wrist were reduced by one-third. No sensory change was found, nor any wasting of the thenar muscles.

Radiographs showed long-standing Kienboeck's disease with much compression and some fragmentation of the semilunar bone.

Surgical exploration showed a 2½ inch separation of the smoothly rounded ends of the flexor pollicis longus and flexor profundus to the middle finger. There was much fraying of flexor sublimis to the index finger and flexor profundus to the middle finger. Loose fragments of semilunar bone were extruded on flexion of the joint.

The semilunar bone was excised and the tendons were repaired with functionally satisfactory results at the end of 6 months, as well as a painless wrist.

FRANCES E. BRENNECKE, M.D.

Back Pain in Relation to the Nerve of the Intervertebral Disc. GUNNAR WIBERG. *Acta orthop. scand.*, 1949, 19: 211.

Back pain may arise from muscles, ligaments, intervertebral discs, intervertebral joints, or possibly the bone. It is unlikely that only the muscles can be made responsible for back pain. Occasionally the patients are awakened at night with pain in the back at a time when the back muscles are relaxed. Leriche and Jung have advanced the opinion that back pain is due to sprain of the ligaments around the vertebral bodies and they proved their theory by injecting procaine into the ligamentous structures with relief of most of the patients' complaints. Luschka, Hovelaque, and Roofe found a nerve to each intervertebral disc. This nerve consisted of a branch from the nerve root and a sympathetic branch. It entered the intervertebral disc through the intervertebral foramen and branched out either in a horizontal or vertical direction. The author dissected spinal columns removed from fetal bodies and adults at postmortem and confirmed these findings. Branches of the little nerves entering the intervertebral discs extended in a horizontal direction. Laminectomies for protruded intervertebral disc done under local anesthesia gave the author an opportunity to exert direct pressure on the intervertebral discs. This pressure was felt by the patient and localized as a deep-seated pain within the back. The author then anesthetized the nerve root. Again the patient had pain on pressure over the intervertebral disc.

The existence of a branch entering the intervertebral disc was demonstrated by surgical dissection of fresh material and by histological sections and special stains. The author accepted Waldenstrom's theory of back pain: The center of the disc protrudes through the ruptured annulus fibrosus and first irritates the little nerves on the periphery of the roots. This irritation causes lumbago. Further advanced protrusion presses on the deeper fibers within the root and causes sciatic pain.

The author concludes that whatever the degree of the back pain may be, the pain is actually caused by a pressure of the intervertebral disc on its ligamentous coverings with secondary pressure on the nerves. The disc may press either on the lateral, anterior, or posterior aspect of the fibrous ring.

GEORGE I. REISS, M.D.

Flat and Plane Osteonecrotic Vertebrae (Calvé's Disease) (Vertebra plata e plana osteonecrotica: m. di Calvé). DOMENICO LOGROSCINO. *Ortop. traumat. app. motore.*, 1949, 17: 39.

The author describes 2 cases of Calvé's disease in male children of 2.5 and 3 years, respectively. In one the fifth vertebra and in the other the third and possibly the second lumbar vertebrae were involved.

This is a rare disease since less than 50 cases have been reported. Clinically, it simulates tuberculous spondylitis, as was clearly demonstrated by the present 2 cases which were characterized by pain on movement and percussion, spinal rigidity, inability of the patient to stand upright, exaggeration of the reflexes (indicating arachnoiditic reaction frequently encountered in Calvé's disease), and the appearance of a small gibbosity. The presence of hereditary syphilis with negative skin reaction, and the absence of abscesses during the entire course of the disease may lead to the suspicion of something else. On the other hand, the roentgen aspect is of prime importance and varies with the stage of the disorder.

In the first stage, characterized by extension of the process of necrosis, the involved vertebra melts away and nearly disappears from the film, usually leaving the peduncle with a moderate lamellar appendix and some detritus. In the second stage the vertebra is irregularly flattened and transversely reduced in diameter between discs of normal or more than normal size. In the last stage the vertebra generally resumes its former shape and size, but without reaching the true shape of the uninvolved vertebrae, and loses its sclerotic density. The onset of the disease is rather sudden with evident clinical and roentgen signs, but its course is slow and usually covers from 2 to 4 years. In most cases only 1 vertebra is involved; in some, first one and later another vertebra is attacked. The disease is acquired and strikes healthy children of from 2 to 10 years, rarely older. Why the process should attack 1 vertebral body is unknown, but various theories have been advanced, among which the most plausible are the infectious, circulatory (trophopathic), and the traumatic. Apparently, the only autopsy is that of Mezzari who reported his findings in a boy of 7 who died of intercurrent diphtheria about 1 year after the onset of Calvé's disease. He found some remnants of bone tissue showing traces of aseptic necrosis, while newly formed bone had already replaced the vertebral body nearly completely. An interesting fact was that the zones of growth of the vertebral body had remained intact and showed only slight irregularities. There was no sign of true inflammation. He incriminated vasomotor changes of the vertebral circulation due to syphilis. The trophopathic theory of genesis of the disease, interpreted in this manner, is undoubtedly more tenable than the other theories.

To favor the regenerative process of the necrotic vertebral body, relief of the spinal column in horizontal position for a sufficiently long time seems to be the only available rational measure. Resumption of the erect posture may be allowed with the aid of an orthopedic corset. RICHARD KEMEL, M.D.

Léri's Pleonosteosis, Carpal Tunnel Compression of the Median Nerves, and Morton's Metatarsalgia. REGINALD WATSON-JONES. *J. Bone Surg.*, 1949, 31-B: 560.

This rare disease is characterized by broadening and deformity of the thumbs, flexion contractures of fingers, thickening and stiffness of toes, limitation of motion of other joints, and mongolian facies.

Hereditary influence of the disease is alluded to by Watson-Jones. Twenty such cases have appeared in the world's literature. He asserts that the paucity of reported cases does not always reflect its true rarity. They are not always diagnosed and Leri's original description may be erroneous. Not all cases of pleonosteosis, for instance, show mongoloid characteristics, nor is it imperative that bony deformity be present.

The eminent writer submits 4 detailed case reports. The first patient is that of a female, aged 21, with flexion contracture of the proximal interphalangeal joints, broadening of the thumbs, toes, and comparable deformities in the mother, aunt, great aunt and great grandmother. No mongoloid features were discernible.

The fourth case was that of a young male patient, aged 20 years. His facies are typical mongoloid. Toes and fingers are broad and contracted. Other symptoms are numbness of fingers, tingling, and pins and needles sensations involving the index and middle fingers of both hands. The presence of bilateral Morton's toe was also disclosed.

At surgery, bilateral lysis of the median nerves with resection of the anterior carpal ligaments resulted in a rapid cure. Subsequent bilateral extirpation of plantar digital neuroma also resulted in prompt cessation of the Morton's phenomenon.

The pathology of pleonosteosis is essentially one of contractures of joints, thickening with fibrocartilagenouslike degenerative changes of anterior carpal ligaments, and concomitant carpal tunnel compression of the median nerve with resultant neuritis. Plantar digital neuroma and metatarsalgia may be a concomitant of pleonosteosis as it too shows capsular as well as ligamentous contracture phenomenon. This, indeed, can be ascribable to ischaemic nerve lesions preceded by degenerative changes in the digital artery (Nissen, 1948).

SAMUEL L. GOVERNALE, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Treatment of Chronic Osteomyelitis with Penicillin and Primary Closure of Operative Wounds. LOUIS G. HOWARD, DONALD G. ANDERSON, KENNETH CHRISTOPHE, THEODORE A. POTTER, and ROBERT L. MOORE. *Arch. Surg.*, 1950, 60: 112.

The authors present an end-result study of from 1 to 6 years in two groups of cases: 32 patients were treated with penicillin only, and 55 patients were operatively treated, with primary closure of operative wounds.

Of the 32 patients treated with penicillin only, the results were as follows: death (the patient was moribund on admission), 1; no healing, 5; healing, 26; healing and relapse, 15; permanent healing, 11.

These statistics influenced the authors to operate on all patients suffering from chronic osteomyelitis

who were able to withstand the necessary procedures. Reviewing the possible causes of failure, it was determined that some organisms became resistant to penicillin, unremoved sequestra had to be removed, scar tissue had to be excised, unhealthy granulation tissue required excision, and all bone cavities required thorough exposure and curettage.

The procedure employed consisted of good preoperative roentgenograms, cultures and resistance studies of the organisms, systemic administration of penicillin of 100,000 units every 3 hours, injection of iodized poppyseed oil (40 per cent) into the sinus tract on the x-ray table, and fresh roentgenograms to demonstrate the course and ramifications of the sinuses. The operation is delayed until there is adequate concentration of the drug to minimize the spread of the disease elsewhere. The local preoperative preparation of the area is done on the operating table. Methylene blue is injected into the sinuses. An adequate incision is made to afford a thorough exposure of the area. Careful hemostasis is imperative; the sinus tracts are completely excised and all sequestra are removed. As much scar tissue as possible is excised. All bone chips are carefully removed. The wound is then irrigated with isotonic sodium chloride solution and the suction apparatus is used throughout the wound. One or more soft rubber catheters are inserted into the deeper portions of the bone and the wound cavity, and are sutured to the skin for postoperative administration of penicillin. The wound is accurately closed in layers and a heavy dressing is applied with the catheters protruding. The ends of the catheters are clamped with hemostats and covered with sterile gauze. Occasionally splints are used to immobilize an extremity. The usual postoperative supportive treatment is given. The systemic administration of penicillin in appropriate dosage, and the local instillation of 25,000 to 50,000 units of penicillin injected into the catheters are repeated two or three times daily. Usually the catheters are removed from the tenth to the fourteenth day. Postoperative rest in bed is continued 2 or 3 weeks after complete healing of the wound.

The age of the patients in the operative cases varied from 14 to 58 years, and the duration of the disease from 3 months to 2 years.

Eighty-one operations were done on 60 bones in 55 patients, with excellent results in most cases; a few had to be operated upon a second, third, and fourth time. DANIEL H. LEVINTHAL, M.D.

Therapeutic Suggestions in the Loss of Opposition Function of the Thumb (Indirizzi terapeutici nella perdita della funzione di opposizione del pollice.) M. CORNACCHIA. *Chir. org. movim.*, 1949, 33: 201.

The author states that without question the opponens function of the thumb is the most important function of any of the digits. Although this movement appears simple, it is in reality a complex movement.

In paralytic cases with freely movable joint motion, he recommends a tendon transplant. If there are no muscular elements that can be used he recommends arthrodesis of the metacarpal phalangeal articulation with the thumb fused in a somewhat flexed and opponens position. This can be obtained best by an osteotomy at the base of the first metacarpal. In cases in which only a slight amount of opponens action exists, a rotation osteotomy of the base of the first metacarpal can be performed to enhance the usefulness of the little action that does exist.

The author stresses the importance of having good function of the index and middle finger before any form of correction of the opponens function of the thumb is planned, otherwise the results of the correction will be poor.

All of the present-day methods of performing tendon transplants for the restoration of the opponens function are described in detail and are illustrated by line drawings.

This article is a review of present day knowledge and does not contain any statistical study or case reports. CARLO SCUDERI M.D.

Intermetacarpal Bone Graft for Thenar Paralysis. Technique and End Results. DONAL M. BROOKS. *J. Bone Surg.*, 1949, 31-B: 511.

A bone graft between the first two metacarpals, to hold the thumb in opposition and abduction, is indicated in thenar paralysis where tendon transplantation cannot be done. In reporting on 16 cases in which bone grafts have been performed, the author suggests some revision of technique to avoid complications which were encountered.

Adduction contracture must be corrected first, by stripping if necessary. In a few cases this procedure was followed by recovery of the abductor pollicis brevis, and no further surgery was necessary.

The graft is taken from the lower third of the subcutaneous ulnar border, making it D-shaped on section. It is of such length as to form a strut between the first two metacarpals when the thumb is in full palmar abduction and rotated into full opposition. Slightly undercut slots are made in the metacarpals in this position, and the graft is driven through them to maintain it. Two chromic sutures are passed through drill holes in the graft and metacarpals. Skin closure only is made, and a cast, changed after 3 weeks, is used to keep the desired position for 12 weeks.

The grafts failed in only 2 cases. Sepsis occurred in several instances until the lines of incision were curved so as to not overlie the graft. Failure of fusion at one end or the other was thought due to inadequate fixation of the graft. "Pollex valgus" occurred twice with inadequate rotation of the first metacarpal, and ulnar displacement of the extensor pollicis longus tendon. The most important feature of the operation for this condition is rotation of the first metacarpal into full opposition.

FRANCIS E. BRENNECKE, M.D.

The Results of Treatment in Kienboeck's Disease. ALFORD DORNAN. *J. Bone Surg.*, 1949, 31-B: 518.

Kienboeck's disease is not common but the treatment and prognosis are especially important since it occurs frequently in patients doing heavy work. Its cause is now generally accepted as avascular necrosis from traumatic interference with the blood supply to the lunate.

In 10 years the author has treated 46 patients with this disease and has been able to trace the progress of 43. Of these, 38 were heavy workers. Of 27 patients treated conservatively (immobilization for 3 to 4 months, or just rest) 63 per cent were able to return to their usual labor, free of pain and with good strength of grip.

Excision of the lunate bone was not performed in elderly patients nor in those showing arthritic changes. Complete freedom from the aching pain was the most striking result of excision, for 69 per cent of these people returned to heavy labor. Both history and radiographs suggest that the disease process usually lies latent for a variable period of time before some injury calls it to the fore with definite symptoms. FRANCES E. BRENNECKE, M.D.

Arthrodesis of the Hip Joint. A Follow-up Study. FRANK E. STINCHFIELD and WILLIAM U. CAVALLARO. *J. Bone Surg.*, 1950, 32-A: 48.

The authors present a follow-up study of 117 patients upon whom hip joint arthrodesis was performed for conditions other than tuberculosis, at the New York Orthopaedic Dispensary and Hospital, during the period from 1935 to 1946, inclusive. Each case was analyzed carefully as to symptoms, physical findings, type of surgery, and progress. Patients were all interviewed and examined. If solid fusion was not obtained at the end of 2 years, the case was considered a failure, even though ultimate fusion may have developed. The follow-up period ranged from 2 to 13 years, with an average of 7 years.

The operative procedures included the trochanteric graft, the iliac graft, the Watson-Jones type of graft, intra-articular fusion, and combinations and variations of these methods. All patients in whom solid bony arthrodesis developed were free from hip pain. The average positions of arthrodesis were flexion of 35 degrees, abduction of 10 degrees, and external rotation of 15 degrees. Arthrodesis with about 30 degrees of flexion seemed to give the patients the most comfort. If a revision of the arthrodesis was required, the method was that of insertion of a Smith-Petersen nail, if no internal fixation had been used, and packing the area with bone chips.

For discussion purposes, the cases are divided into groups according to diagnosis, and include (1) poliomyelitis with dislocation, (2) congenital dislocation, (3) suppurative arthritis, and (4) osteoarthritis. The etiology of the last group included coxa plana, fracture of the femoral neck, slipped femoral epiphysis, traumatic dislocation, multiple joints with osteoarthritis, central dislocation, osteochondritis dissecans, and Charcot's joint.

The purpose is not to evaluate arthrodesis as a method of treatment, but rather to present an objective analysis of a group of cases in which it was used.

Nine poliomyelitic patients with dislocation were operated upon with improved function. The primary indication for surgery was instability. Twenty patients with congenitally dislocated hips were arthrodesed. The chief complaints were limp, pain, and deformity. Better results were obtained in patients who were under 21 years of age than in those in the group over 35 years of age. Nineteen patients were operated upon for residuals of suppurative arthritis. Pain and restriction of activity were the chief complaints. Following arthrodesis, the patients were able to participate in competitive athletics. Sixty-nine patients were operated upon for osteoarthritis of the hip. Pain was the presenting symptom. In cases in which arthrodesis was successful, complaints referable to the hip were absent and activities depended upon the general physical condition.

Nine charts are included to demonstrate relevant findings. Certain of these data follow: The most normal gait resulted in patients with very slight adduction and no shortening. The poorest gait was in patients with equal limb lengths and abduction; this created a relative lengthening of the fused side, not compensated for by the opposite extremity. The over-all pseudarthrosis rate was 23 per cent. In 17 of the 27 failures, repair was carried out. Revisions were successful in 8 cases. Slightly better percentages of fusion were obtained in patients treated by intra-articular fusion accompanied by a Smith-Petersen nail and bone graft, or by intra-articular fusion plus carpenter-type vitallium nails inserted from three different directions. The poorest results followed an attempt to arthrodese the hip by the use of a long three-flanged nail without the joint cartilage being removed. In 31 per cent of all fusions, the patients had some degree of backache, either after prolonged sitting or exertion. There was an infection rate of 6 per cent with two complete failures. Some cases of pseudarthrosis showed fusion after 2 years without further surgery.

KENATH H. SPONSEL, M.D.

Extra-Articular Tibiotarsal Arthrodesis (L'arthrodèse tibio-tarsienne extra-articulaire). R. DUCROQUET, J. DUCROQUET, and J. E. LESCOEUR. *Presse méd.*, 1949, No. 81: 1206.

The author has devised a new extra-articular flexion procedure for posttraumatic or infectious arthritis of the ankle, which he prefers to the other stabilization methods including astragalectomy. The advantage lies in the extra-articular fixation which does not stir up an intra-articular focus of infection.

The procedure for stabilization is as follows: an incision 1 cm. long is made from the posterior inferior surface of the calcaneus, and a counter incision 2 to 3 cm. in length is made over the posterior tibial surface, under which a graft is anchored after being

driven through the posterior calcaneal portion. This strut ensures absolute fixation of the astragalus.

In some cases the additional fusion of the subastragalar joint was necessary and an anterior tibioastragalar graft, or fixation by a Smith-Petersen nail driven through the calcaneoastragalar joint and the lower tibia was accomplished. A 5 to 10 degree equinus position is advised. The compensatory mobility in the midtarsal joints follows after a few months.

Of 15 patients with fibulotarsal tuberculosis, 12 had good results, the rest showed fracture or absorption of the graft. In another group, 6 patients in whom astragalectomy was done for tuberculosis or fracture of the astragalus, with an anterior and posterior graft, no failures were noted.

The observation time of one year for such a technical procedure seems too short for a final evaluation.

ERNEST H. BETTMANN, M.D.

Stabilizing Operations on the Foot. A Study of the Indications, Techniques Used, and End Results. ROBERT LEE PATTERSON, JR., FRANK F. PARRISH, and ELWOOD N. HATHAWAY. *J. Bone Surg.*, 1950, 32-A: 1.

At the Hospital for Special Surgery, in New York, over 1,300 operations for stabilization of the foot were performed during the years from 1935 and 1947, inclusive. During the past year, 305 of these procedures were carried out on 233 patients. Any operative procedure for stabilization is intended to correct deformity or instability, or to relieve pain which greatly handicaps a patient in his normal stance or gait.

The general operative technique is described. The foot is lined up properly with the ankle mortise. It is never aligned with the knee.

A description of the findings in the 8 procedures utilized is presented. The operation was considered a Hoke arthrodesis when the head and neck of the talus were excised, with a portion reinserted later, and the talocalcaneal joint resected. Correction of the deformity was good in 27 cases, fair in 22 cases, and poor in 7 cases. Incomplete correction of varus or valgus at operation occurred 19 times. Satisfactory results were obtained in 87.5 per cent of cases. The 45 patients upon whom 56 Hoke arthrodeses were performed had fewer complaints at re-examination than had patients treated by any other operative method. The percentage of pseudarthrosis was far smaller. This procedure cannot be relied upon to correct dropfoot, but if adequate muscle power is available, which can be transposed to the dorsum of the foot, the prognosis for alleviation of this deformity is excellent.

Brewster countersinking operations were performed in 10 cases, with satisfactory results in 8. The authors imply that the procedure is technically difficult to carry out. There appears to be a tendency for displacement of the talus from the countersunk position. Muscle power for dorsiflexion is partial assurance for correction of dropfoot with this operation.

Resection of the cartilaginous surfaces of the talonavicular, calcaneocuboid, and talocalcaneal joints was considered by the authors to be a triple arthrodesis. Satisfactory results were obtained in 75 of the 89 cases in which triple arthrodesis was performed. There were 14 failures, and in 9 of these, undercorrection of the deformity was evident immediately after operation. Pseudarthrosis occurred 12 times at the talonavicular joint; in 2 cases it was of sufficient severity to result in the grading of the operation as a failure. Triple arthrodesis is the most commonly used stabilizing procedure. It does not lend itself well to backward displacement of the foot, as the head and neck of the talus are left intact. It is not so adaptable to the correction of a fixed equinus as the Lambrinudi procedure; nor was it used in the correction of so many types and combinations of deformities as was the Hoke stabilization.

The Lambrinudi stabilization was done 55 times, mostly for fixed equinus deformity. Satisfactory results were obtained in 85.5 per cent. Of the failures, 2 were due to painful pseudarthrosis and 6 to residual deformity. The Lambrinudi procedure is preferable for the correction of fixed equinus. The susceptibility of the talonavicular joint to nonunion appears to be increased by this operation, as witnessed by 29 per cent of pseudarthrosis in this series.

Panarthrodesis was performed in 20 patients, with satisfactory results in 18. There were 4 instances of wound sloughing. Two stage procedures are suggested for extremities with impaired circulation. Three patients had fatigue fractures of the lower end of the tibia, at the site of the sliding graft.

Wedge osteotomy of the tarsus was not found to be a good operation as it usually did not attack the site of deformity. Residual deformities were commonly present.

Subtalar arthrodesis, combined at times with fusion of one other joint, gave good results in only 68 per cent of cases. These results serve to emphasize the difficulty of correction of the deformity unless a three-joint arthrodesis is done.

Results of operations on the basis of etiology are discussed and tabulated. Poliomyelitis, spastic paralysis, Friedreich's ataxia, clubfoot, painful flatfoot, and other conditions are included in the main groupings.

Various other factors are recapitulated. Forty-seven per cent of patients up to the age of 9 obtained poor results. Avascular necrosis has been observed in each of the cuneiform bones—the cuboid, talus, and the navicular. Rocker-bottom deformity was caused several times when forced dorsiflexion was employed to overcome fixed equinus, instead of removing sufficient bone. Thirty-six revisions were performed and in 75 per cent of these the results were satisfactory. The percentages of failures with the Hoke stabilization, the Brewster countersinking operation, the Lambrinudi stabilization, and the triple arthrodesis were comparative. Undercorrection at the time of operation was usually the common

denominator of this group. Measurement of the foot which had been operated upon disclosed that it averaged eleven-sixteenths of an inch shorter than the foot not operated upon.

The reader is referred to the original article for more exacting analysis.

KENATH H. SPONSEL, M.D.

FRACTURES AND DISLOCATIONS

Intercarpal Dislocations and Fracture Dislocations. A Review of 59 Cases. T. B. RUSSELL. *J. Bone Surg.*, 1949, 31-B: 524.

In a review of 59 cases of dislocation, there were 27 transscaphoperilunar fracture dislocations. The roentgenographs may sometimes be misinterpreted, as the injury is not one that is commonly seen. When examined early, backward displacement at the midcarpal level is obvious and radial deviation of the hand is usually present, with painful limitation of finger and wrist motions. The injury involves severe ligamentous damage, and chip fractures of other carpal bones are frequent. Avascular necrosis of the proximal scaphoid fragment occurred in half the cases. Transient median nerve paralysis was seen twice.

In patients seen not later than 2 weeks after injury, the dislocations were reduced by closed manipulation and maintained in palmar flexion by a plaster cast for 3 weeks, to prevent recurrent subluxation. Further immobilization in the neutral position was maintained until union of the scaphoid was secured, an average of 5½ months.

Attempts at closed reduction later than 2 weeks after injury were apt to cause additional damage to the wrist, therefore open reduction was done. In long neglected cases arthrodesis of the wrist was advised.

In cases in which avascular necrosis of the proximal scaphoid fragment supervened, the grafting procedure was disappointing. Equally good results were obtained in these cases by excision of the proximal fragment and prolonged immobilization.

Anterior dislocation of the lunate occurred in 14 instances. Dislocations seen within 10 days of injury could be reduced readily, and were held by plaster in palmar flexion for 1 week, then in neutral for 2 weeks longer. In cases seen "late," excision of the lunate through the anterior approach was done with good end results.

Perilunar dislocation of the carpus without fracture of the scaphoid was seen three times. Closed reduction and plaster immobilization for 3 to 4 weeks sufficed for good results.

Anterior dislocation of the lunate with the proximal scaphoid fragment occurred 5 times, and with the distal fragment once. Closed reduction and immobilization in plaster proved satisfactory. Excision of the lunate and displaced scaphoid fragment is not recommended.

A syndrome of recurrent subluxation of the scaphoid, which occurred in 3 cases, is best handled by conservative treatment, or by scapholunate arthrodesis where the former fails.

Other rare dislocations are mentioned, and all are amply illustrated by roentgenographs.

FRANCES E. BRENNECKE, M.D.

Fractures of the Lateral Tibial Condyle. CHARLES H. BRADFORD, RICHARD M. KILFOYLE, JOHN J. KELLEHER, and H. KELVIN MAGILL. *J. Bone Surg.*, 1950, 32-A: 39.

Forty cases of fractures of the lateral tibial condyle are reported. The basic mechanism for all fractures of the lateral tibial condyle is an impaction of the condyle of the femur against the plateau of the tibia.

The authors have classified these tibial fractures into three general types: Type 1, the "crush fracture," which consists of all degrees of compression of the lateral tibial condyle with mild or extreme depression of the plateau; Type 2, the "split fracture," in which the condyle, instead of being crushed, is split off with little, if any, depression; and Type 3, the "shatter fractures," in which the force of the trauma extends obliquely toward the center of the knee and downward, to break away the support of the shaft or of the medial condyle at the neck of the tibia.

All of the crush fractures (Type 1), 29 in number, were treated conservatively. This consisted of manipulation under anesthesia, with compression of the condyles and varus force on the knee. A long leg cast is applied also with a varus force. After a period of 2 or 3 weeks the cast is removed for early nonweight-bearing exercise. From this time until the healing time of about 4 months, a long leg brace with a varus force is used. This is worn 24 hours a day, except for periodic exercise. Clinical signs of meniscus tears were found in only 3 cases but the patients were not sufficiently disturbed to desire surgical correction.

Four cases of split fractures (Type 2) were encountered. One patient with a tear of the lateral meniscus was operated upon.

Seven shatter fractures (Type 3) were treated. These are the most severe injuries. The neck of the tibia is shattered and both the medial and lateral condyles are split off. No arbitrary rule can be made to distinguish between operative and nonoperative cases. If the displacement is gross, with fragments large enough to permit internal fixation, the advantages of open reduction probably outweigh the risks of surgery. Operation was performed in 4 of the 7 cases. In 2 of these the results have been very successful; in the other 2 the time has been too short for final evaluation.

Eleven of the 29 patients with Type 1 fractures obtained excellent results; in 8 cases the results were classified as good. In Type 2 fractures there was 1 excellent result and 3 good results in the group of 4 cases. There were 3 good, and no excellent results in the group of 7 Type 3 fractures.

KENATH H. SPONSEL, M.D.

The Influence of the Contact-Compression Factor on Osteogenesis in Surgical Fractures. G. W. N. Eggers, Thomas O. Shindler, and Charles M. Pomerat. *J. Bone Surg.*, 1949, 31-A: 693.

The authors discuss the physiological and pathological factors of fundamental orthopedic concepts. There is no doubt that contact-compression is one of the major mechanical factors in bone healing. Experiments were ingeniously carried out on the skulls of mature white rats. The technique of these experiments is included.

The technique is discussed and numerous photomicrographs show beyond any doubt that too much or too little compression cannot be applied in the healing of bones. The areas which received extreme pressure became necrosed with a delay in osteogenesis, while those areas under more ideal pressure showed excellent activity. When no pressure was applied there was no osteogenic response.

The presence of infection at the fracture site does not alter the tendency of osteogenesis to be more active in the area upon which contact-compression is exerted. Richard J. Bennett, M.D.

Practical Experiences with Kuentscher Nailing (Praktische Erfahrungen mit der Kuentschernagelung). Richard Haberkorn. *Chirurg.*, 1949, 20: 648.

Increasing use of Kuentscher nailing is being made in the author's clinic with gratifying results. However, the older methods of fracture treatment have not been discarded as nailing is used only in cases in which the usual methods do not give promise of success.

Two illustrative cases are presented, in which a consideration of the indications and results shows the value of open intramedullary nailing in conjunction with the use of penicillin and sulfonamide therapy in the treatment of a fresh and of an old, infected fracture, in which other methods of treatment threatened failure. John L. Lindquist, M.D.

ORTHOPEDICS IN GENERAL

Variation in Extension of the Metacarpophalangeal and Interphalangeal Joints of the Thumb. H. Harris and J. Joseph. *J. Bone Surg.*, 1949, 31-B: 547.

The misnomer, "double-jointed" metacarpophalangeal joint of the thumb, has been extensively studied among 133 males and 100 female Europeans, in contrast with 31 male Indians and 30 male West Africans. The source of material was derived from university students. Considerable variation in the range of motion was found between the right and left thumbs of many individuals. While the mean angle of extension of the metacarpophalangeal joint was comparable in all groups studied, the female Europeans did exhibit a greater mean angle than the male European students. On the other hand, the range of interphalangeal extension in male Europeans is appreciably greater than in the female, but is less than in the Indian and African male groups.

Moreover, the authors have observed greater hyperextension (over 40 degrees) in the left thumb than in the right, in females than in males, and in male Indians than in male Europeans and Africans.

The contour of the metacarpophalangeal articulation (be it round or flat), the relative capsular relaxation, and the laxity of tendinous apparatus are some of the anatomical variants responsible for the so-called "double-jointed" thumb. It is believed that treatment is unwarranted.

Samuel L. Governale, M.D.

Pott's Paraplegia. George J. Garceau and Thomas A. Brady. *J. Bone Surg.*, 1950, 32-A: 87.

This study is based upon an analysis of 15 children and 17 adults suffering from Pott's paraplegia.

The symptoms of Pott's paraplegia become evident when there is interference with the conductivity of the spinal cord. In early-onset paraplegia, the signs appear early, usually during the first 2 years of the disease. The paralysis may appear even before the diagnosis of tuberculosis of the spine has been made. The palsy is usually more complete than in the late-onset type. The authors believe the symptoms are caused by inflammation, edema, or abscess formation. Therefore, rapid and complete recovery usually follows efficient recumbency treatment. Paraplegia of this type is common and requires no surgery for relief unless, while under conservative treatment, it progresses and shows symptoms of the late-onset type.

Late-onset paraplegia occurs from 2 to many years after onset of the spine lesion. The disease process either has never been quiescent, or reactivation has occurred. The paralysis is often incomplete, selective, and progressive. Girdle pains may be the first complaint, although loss of co-ordination in the lower extremities may be the initial symptom. The reflexes are hyperactive. Loss of sensation appears late in the progress of the disease and may be patchy. Loss of sphincter control is a later development in the disease. The paralysis is evident with the extremities in flexion. The slightest stimulation will cause the lower extremities to flex vigorously at the knees and hips, which may be attended with much pain. It may become difficult to hold down the lower extremities. Anesthesia of the lower extremities is more diffuse, and loss of vibratory sense is apparent. The condition of the patient becomes rapidly worse, and there is danger of permanent paraplegia. The prognosis is then grave. Certainly surgical intervention should be contemplated before the paraplegia has progressed to this stage, especially if partial or complete spinal fluid block has been demonstrated.

Careful postmortem studies were made of 3 patients who died in a paraplegic state. Eleven patients who had been subjected to surgical exploration were also observed. The pathologic findings and observations indicated that paraplegia may be attributed to mechanical and inflammatory factors. The mechanical factors are (1) encroachment on the

cord by tuberculous tissue; (2) direct local pressure by a paravertebral abscess; (3) pressure from a sequestrum; and (4) pathologic fracture dislocation at the kyphos. The inflammatory causes may be (1) toxic; (2) a vascular reaction, secondary to the disease; and (3) pachymeningitis.

When conservative treatment of 3 or 4 months' duration fails to show signs of beginning recovery, surgical indications should be sought and the route to be followed should be determined. Spinal fluid block may be the deciding factor.

Laminectomy is indicated in tuberculosis of the vertebral appendages, and when there is minimal evidence of a tension abscess or of bone pressure. It may also be indicated following a nonproductive costotransversectomy. A tuberculous vertebral appendage, a granuloma, or a caseous abscess within the spinal canal is easily exposed and removed. The authors have recently observed 2 patients with tuberculosis of the vertebral appendages; both of these patients have made rapid recovery following laminectomy.

Costotransversectomy is indicated when there is evidence of a tension abscess or a sequestrum. The abscess is drained away from, rather than around, the spinal cord.

If the spine has not been fused previously, fusion may be done at operation or afterward. Eleven of the 32 patients had had spine-fusion operations previous to the onset of the paraplegia.

Of 6 patients operated upon less than 9 months after the onset of the paraplegia, 5 completely recovered and 1 died. Of 4 patients operated upon 1 year or more after the onset of the paraplegia, 2 died, 1 patient completely recovered, and 1 remained unimproved. Patients operated upon fairly early, in whom conservative treatment had failed, recovered more rapidly and completely than those operated upon later. Of 22 patients treated by recumbency, 11 completely recovered, 3 were unimproved, 3 recovered partially, and 5 died. No ill effects or deaths could be attributed to the surgical procedures which had been employed.

RUDOLPH S. REICH, M.D.

Chemotherapy in the Treatment of Orthopedic Tuberculosis. SVANTE ORELL and PER OSTMAN. *Sven. Laek, tidn.*, 1949, 52: 2810.

At the orthopedic clinic of the St. Göran Hospital, in Stockholm, to which every case of bone and joint tuberculosis in this city is directed, the authors have now, after 2 years of experimentation with PAS and streptomycin, proceeded to give PAS as a basic medicine, and have reserved the combination with streptomycin especially for cases in which they perform operation on the tuberculous lesion. They give PAS in a dose of 14 gm. daily without restrictions in time, and have seen no serious secondary effects of this drug. Streptomycin is given as a protective course of therapy 3 days before the operation (1 gm. daily divided into two doses) and is continued over a period of 2 weeks. At the same time that the streptomycin is given, penicillin is administered in doses of about 400,000 units daily as a protection against mixed and secondary infections.

The operation consists in evacuation of tuberculous bone lesions, scraping of abscesses, and excision of sinuses; penicillin and streptomycin are applied locally (0.5 gm. of streptomycin and 200,000 units of penicillin in substance) in the evacuated abscess. As a rule, primary suture is employed. The authors state that, compared to earlier principles, the indications for operation have been extended, and they have operatively attacked even closed posterior tuberculous sinuses of vertebral origin. With the use of streptomycin therapy of short duration, they hope to avoid the most serious disadvantages of the streptomycin: bacterial resistance and lesions of the auditory nerve. This is most important, as there is often even another localization of the tuberculosis.

The preliminary results of the combination of PAS and streptomycin indicate much promise.

PHILIP LEWIN, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

The Walking Venous Pressure Test as a Method of Evaluation of Varicose Veins. EUGENE A. WHITE and RICHARD WARREN. *Surgery*, 1949, 26: 987.

It is believed that chronic venous stasis in the legs is due to incompetency of one, or both, of the superficial and deep (femoropopliteal) venous systems; however, it is less certain whether or not the same factors operate to produce the symptoms which cause the characteristic morbid changes.

Inasmuch as the method of therapy will depend on what venous system is faulty, and as the clinical tests described by Trendelenberg, Perthes, Mahorner, and others have not been a reliable means of determining the degree of deep involvement in many cases, a technique of measuring venous pressures has been adopted to assist in the diagnosis. It is employed in extremities in which deep incompetency of the venous system is suspected, in patients who have had a recurrence after previous surgery, and in patients whose symptoms are out of proportion to the extent of the varicose state.

Although there is little difference in venous pressures in normal and abnormal conditions when the subjects are at rest, recumbent or standing, striking differences appear when the patients walk. A needle is inserted in a superficial vein of the lower leg or ankle and connected to a manometry system containing an isotonic solution. The zero point is the resting erect venous pressure (REVP). In this series of measurements the mean fall of pressure when walking erect (WEVP) was 51.7 cm. in normal legs; in varicose superficial veins, 26.6 cm.; and in postphlebitic extremities, 1.8 cm. If the saphenous veins were occluded by digital pressure or tourniquet, the pressure while walking (WEVPSO) fell 45.2 cm. in normal legs, 57.2 cm. in varicose legs, and 0.7 cm. in postphlebitic legs.

The pressure studies are relied on even in cases in which the history of previous deep phlebitis is obscure. On the other hand, it has been determined that the deep system is intact in extremities in which more than just saphenous system involvement was suspected because of the presence of ulcers, edema, and pigment changes. Furthermore, it has been demonstrated by microscopic examination of excised vein segments that inspection of a femoral vein at operation is not sufficient to claim its normalcy. Venography has been uncertain and undependable.

The pressure tests are applied also to determine which saphenous veins, long or short, are involved, and the presence and position of incompetent communicating veins between the deep and superficial systems.

There is no agreement with the concept of Adams that vein interruptions are beneficial by virtue of preventing the excessive hydrostatic pressures of straining, but it is held that the procedures are operative in improving the general venous function by increasing the rapidity of recovery from the effects of straining.

Two hundred and sixty legs with varicose veins have been operated on. Of these, 125 were treated by simple ligations and 135 by stripping, as described by Linton. It has been noted that venous pressure responses tend to be slightly better after stripping. Satisfaction with the results of this procedure has led to its adoption for all cases of large and symptomatic varicose veins.

In 27 legs, measurements of WEVPSO soon after operations showed responses as predicted in all cases. Ten cases were studied again, after a period of 4 months or more, and all had continued improvement. LEONARD D. ROSENMAN, M.D.

Venous and Lymphatic Stasis in the Lower Extremities: A Test for Incompetence in the Perforating Veins; A Simple Method of Adequate Control. W. J. MERLE SCOTT and MICHAEL RADAKOVICH. *Surgery*, 1949, 26: 970.

When edema and induration obscure the superficial veins, the conventional tests for competency of the perforating veins are unsatisfactory. The authors have devised a test for evaluating those veins, based on the observed increase of volume which occurs in legs with valvular incompetency when they are lowered to a dependent position. Changes in volume are reflected by changes in circumferential area, and are measured by winding the lower leg with parallel turns of cloth tape. Measurements are taken first with the leg elevated to 45 degrees; then, immediately after standing, with the saphenous veins occluded by a tourniquet; 5 minutes later, without the tourniquet; and last, after 5 minutes elevation.

The maximum increase of total circumference in normal legs is 6 inches, and is usually less than 3 inches. Patients with simple saphenous varicosities show a normal amount of increase; however, those with incompetency of the perforating veins have larger than normal changes. The greatest increase in the latter cases is in the second measurement which is as great as 20 inches in some cases.

Two conditions may interfere with the postural changes characteristic of incompetent perforators: (1) acute inflammation with swelling, and (2) acute superficial vein thrombosis with obstruction of the incompetent vessels.

The surgical correction of incompetent perforators has been difficult because the underlying defect continues to favor the development of more incompetent vessels even as others are interrupted. Furthermore, those vessels at or below the ankle are particularly difficult to manage by conventional methods: ligation and stripping of the saphenous

veins, flap operations to expose the perforating vessels for ligation, and the application of external support. In the latter problem, the defects of elastic bandages and quasi-rigid boots are notable. To overcome those defects, e.g., ill fit and lack of compression, a legging has been devised which contains an inflatable rubber bladder controlled by the patient. The pressure within the bladder undergoes cyclic changes with contraction of the leg muscles, subjecting the subcutaneous veins to rhythmic compression.

The proper use of this legging has yielded success in treating patients with incompetent perforators. It has been found that a greater pressure (50 mm. Hg) is needed for inframalleolar ulcers than for the usual ankle or lower leg ulcers (35 mm. Hg). In the presence of dermatitis and epidermophytosis, special attention to maceration and active treatment of the fungus infection are needed to permit comfortable use of the legging. The legging may be used safely in the presence of arteriosclerotic arterial insufficiency.

LEONARD D. ROSENMAN, M.D.

Collateral Circulation in the Presence of Experimental Arteriovenous Fistula. ROY L. ROBERTSON, E. W. DENNIS, and D. C. ELKIN. *Surgery*, 1950, 27: 1.

The viability of the affected part in vascular trauma, in most instances, is dependent upon the collateral circulation, and in the presence of an arteriovenous fistula an abundance of collateral circulation is demonstrable. The striking difference in clinical results following the occlusion of a normal artery and the excision of an arteriovenous fistula prompted studies of the development of collateral circulation in the two conditions.

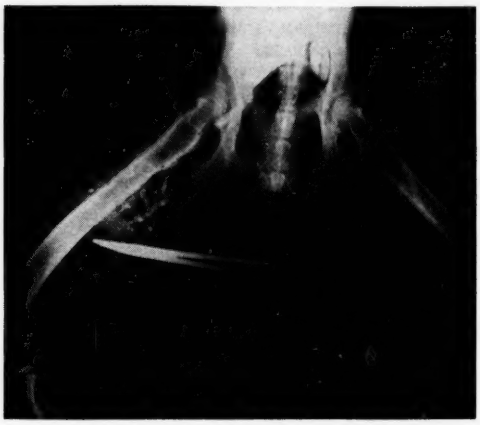


Fig. 1 (Robertson *et al.*). Roentgenogram of the arterial tree in the normal and affected hindlimb of a dog with femoral arteriovenous fistula. The accompanying vein is ligated and does not fill. The similarity of pattern of arterial branches in each limb and the disparity of size are shown. The smaller channels near the hemostat are undoubtedly in part venous.

Operative procedures used at present are devised to preserve to the maximum extent the collateral bed.

Until recently it was generally held that the collateral arterial bed developed over a period of months after the production of the fistula. Now, however, some investigators believe that an effective arterial collateral circulation develops early and advise early surgical intervention.

The primary origin of the collateral circulation is the pre-existing branches of the major vessels which undergo progressive hypertrophy and dilatation, and the actual blood flow per unit volume of tissue and per unit of time offers the most accurate estimate of the collateral circulation.

The disturbances arising from an arteriovenous fistula depend upon the size of the fistula, the caliber of the affected artery, and the duration of the lesion. A variable amount of blood enters the venous system through the fistula and is swept back toward the heart, serving no useful function. The relatively high blood pressure of the arterial side is rapidly dissipated. The collateral vessels, enlarged and hypertrophied, carry an increased blood flow which may serve no useful function while the fistula is present. Upon elimination of the shunt, the collateral vessels will then carry adequate blood to the distal portions of the extremity. Distal to the fistula there is venous engorgement and edema due to the high venous pressure in the vicinity of the fistula.

After the occlusion of a normal artery, blood must flow through pre-existing arterial channels which have undergone no hypertrophy or dilatation. The distal blood flow may or may not be adequate for tissue survival.

Experimental investigation was done by producing arteriovenous fistulas and acute occlusions of the femoral vessels in adult dogs. Blood flows in both the normal and affected extremities were determined. The 5 animals tested with acute arterial occlusion showed consistent results of a fall in blood flow after occlusion which gradually increased but did not reach preocclusion levels after 20 minutes. Upon release of the occluded artery, the blood flows rose to normal or above normal.

Animals with arteriovenous fistulas gave strikingly different results. With the fistulas open, the blood flow in the distal extremity was, in many instances, below normal. After occlusion of the fistula, augmentation of the distal blood flow was exhibited in all but 2 animals, which 2 animals were found to have fistulas that had decreased in size. Larger increases in flow were seen predominantly in the animals with the older lesions.

In animals with simultaneous measurement of the blood flows in the normal and the affected limbs before and after closure of the fistulas, there was no appreciable increase in the flow in the normal limb despite the changes in the mean blood pressure. This may discredit blood pressure increase as a factor in the local increases of blood flow in the affected extremity.

The decrease in the flow of blood following acute occlusion may be due partly to spasm of the vessels and partly to the time required for redistributing the flow through smaller branches. Apparently, the collateral circulation attempts to function at a maximum degree but falls short of the normal flow values in almost all instances.

An extremity affected by an arteriovenous fistula seems to have adequate nutrition. After occlusion, the collateral bed which develops carries a flow which is increased above the values sufficient for adequate nutrition of the limb.

The factors important in the development of the collateral circulation are: (1) the arteriovenous shunt must have been present long enough to permit maximum dilatation and hypertrophy of the collateral vessels, and (2) the fistulas must exceed a certain size, as the fistulas which decrease in size may fail to excite the formation of a collateral circulation.

In some instances there may be, after the excision of the fistula, a regression of the collateral circulation over a period of months resulting eventually in a collateral circulation which is approximately the same as that following simple ligation of the artery. The crux of the problem seems to be to insure the presence of a maximum collateral bed immediately after the excision. In the authors' opinion, their work with animals gives support to the policy of delay in the treatment of arteriovenous fistulas in order to allow for the maximum development of the collateral circulation.

JACOB T. BRADSHER, JR., M.D.

A Study of the Collateral Circulation After Excision of the Arteriovenous Fistulas. LEWIS H. BOSHER, JR., FLEMING HARPER, and I. A. BIGGER. *Surgery*, 1949, 26: 918.

Despite abundant collateral circulation which develops in the region of an arteriovenous fistula, excision of the fistula with interruption of the main artery to the extremity frequently results in chronic vascular insufficiency to the extremity. Weakness of the extremity, easy fatigability, susceptibility to cold, intermittent claudication, color changes, muscular atrophy, and ulceration are common manifestations. Even after sympathectomy certain cases manifest vascular insufficiency. The explanation, previously suggested by Bigger, is that regression of the arterial collateral bed occurs. Other authors have observed, after fistulectomy, a reduction in the size of the proximal artery and a cooling of surface temperature.

These investigations demonstrate in the experimental animal the definite regression of the collateral bed following fistulectomy. Femoral fistulas, 2 to 2.5 cm. long, just distal to the profunda branch, were constructed in dogs, and excised after periods of from 6 weeks to 13 months. The arterial collaterals were demonstrated roentgenologically in the living animal by intra-abdominal aortic injection of 75 per cent neoiopax or 70 per cent diodrast. Immediately after fistulectomy the main artery and its branches proximal to the fistula enlarged considerably, as did the main artery and its anastomotic branches distally. The collaterals were more numerous, more dilated, and more tortuous when compared with those developing after simple ligation. No collaterals extended into the lower leg.

One group of dogs with unilateral fistulas maintained for 11 to 13 months before excision, and then followed for 7 to 15 weeks, showed moderate to marked regression of the collateral bed, the regression being readily noted as early as the fourth or fifth day after fistulectomy, at which time the size of the distal artery was also reduced. The proximal artery did not return to normal size until the second or third week.

In the second group of animals, unilateral fistulas were maintained for only 6 to 8 weeks, and the contralateral main vessels were ligated at the time of fistulectomy. A profuse collateral bed developed around the fistula but the vessels were smaller than with the fistulas of longer duration. The collaterals remaining after 8 weeks of regression following fistulectomy were generally equal to those forming for 8 weeks on the contralateral side as a result of ligation.

In the third group the contralateral ligation was performed at the same time the fistula was constructed. After a period of from 15 to 20 weeks, fistulectomy was done. Six weeks later the collateral bed on the side of the fistulectomy was approximately equal to that on the side of simple ligation.

To exclude any possible influence of the contrast medium on the regression of collaterals, a fourth group, prepared as in the third, were not given injections until at intervals of from 2½ to 10 weeks after fistulectomy, at which time roentgenograms were made and the animals were sacrificed. The collateral beds in this group were the same as in the third group.

Histologically, the smaller collateral arteries, 0.2 to 1.0 mm. in diameter, in the region of greatest collateral development showed minimal to marked fibrous proliferation in the subintima, and fragmentation of the internal elastic membrane. These were observed at the time of fistulectomy. Whether this process continues is not known.

It is recognized that the lower extremity of the dog is shorter than in man, and that the central artery of the aortic trifurcation in the dog provides an excellent collateral supply to the thigh through the pelvis.

The enlarged artery immediately distal to the fistula in the animals signifies a retrograde flow which is responsible for the dilatation of the anastomotic channels arising distal to the fistula. If no retrograde flow occurred we would not expect a greater collateral bed than that occurring after simple ligation of the artery. Immediately after excision of the fistula these collateral channels direct an abundant supply into the distal tissues, increasing the blood volume supply distally, as shown by Robertson, Dennis, and Elkin, to as much as 210 per cent more

than before occlusion of the fistula. But a marked contraction of the collaterals occurs, beginning quite early. The rapidity of the regression suggests the importance of the mechanical factors of altered pressure and blood flow rather than such biologic factors as disuse or lack of need.

DAVID MOVITZ, M.D.

Attempt to Revascularize an Extremity by an End-to-End Arteriovenous Anastomosis (Essais de revascularisation d'un membre par anastomose artério-veineuse termino-terminale). LUCIEN LEGER. *Presse méd.*, 1949, No. 81: 1198.

The first attempts to perform an arteriovenous anastomosis for therapeutic purposes were made by San Martin J. Stratustegui in 1902.

A man, aged 56 years, who was suffering from arthritis of his lower extremities underwent a right lumbar sympathectomy in 1943. Four years later an amputation of the left thigh was required. In 1948 a black slough appeared on the right third toe. An occlusion of the common femoral vein at its bifurcation was found. A thrombus was removed from the superficial femoral artery, and an arteriovenous anastomosis between this artery and the femoral vein was made with Blakemore's vitallium tube. Oscillations in the corresponding leg, absent before the operation, recurred, but they lasted only 48 hours. The temperature of the involved extremity returned to normal levels and the anesthetic zone on the foot disappeared. Cicatrization of the ulcer took place.

Arteriography, 12 days following the operation, failed to demonstrate passage of the opaque medium through the anastomosis. Ten months later severe pains in the region of the median plantar nerve, and gangrene of the foot necessitated amputation of the thigh.

Subjective and objective amelioration after operation could have been due either to the ligation of the distal segment of the vein or to the section of the sympathetic fibers surrounding the artery. Apparently the heparinization was insufficient to prevent occlusion of the anastomosis.

A man, aged 44 years, with intermittent claudication underwent iliac periarterial sympathectomy, popliteal endarterectomy, and left suprarenalectomy at intervals of 2 years. Each operation was followed by a transitory improvement. The first 2 toes became cyanotic. Arteriography revealed an occlusion of the left femoral artery in Hunter's canal. At operation the artery appeared spastic but permeable in Scarpa's triangle, but the superficial femoral vein was thrombosed. A long segment of it was resected. Anastomosis was established between the proximal end of the superficial femoral artery and the distal end of the profunda vein. Three weeks after the operation the pains were alleviated, the slough disappeared, and the presence of a thrill and a systolic murmur over the anastomosis, as well as arteriographic findings, demonstrated the integrity of the new stoma. JOSEPH K. NARAT, M.D.

BLOOD; TRANSFUSION

The Prothrombin Consumption Test: Its Clinical and Theoretic Implications. ARMAND J. QUICK and JEAN E. FARRE-GILLY. *Blood*, N. Y., 1949, 4: 1281.

Modification of a previously reported prothrombin consumption test is described. It was noted that the fibrin mesh in a normal clot rapidly absorbed the nascent thrombin, effectively preventing the initiation of the chain reaction mediated by the action of thrombin on the platelets. Therefore, in the in vitro clotting of normal blood, all of the fibrinogen is converted to fibrin before the prothrombin is diminished. The newer test utilizes a series of tubes of clotting blood from which citrated serum is obtained by centrifugation.

The rather wide variation in prothrombin consumption during the clotting of normal blood suggests a hitherto undemonstrated variation in the thromboplastin factors. This makes more credible the old and wholly hypothetical concepts of hypercoagulability.

In hemophilia the consumption is incomplete. This finding is consistent with the theory of Quick, that the fault in hemophilia is a deficiency of thromboplastinogen, which is normally activated by an enzyme furnished by the platelets.

The lack of platelets in thrombocytopenic purpura causes an incomplete prothrombin consumption. The conversion of prothrombin increases with the increase of platelets after splenectomy. It can be demonstrated, therefore, that there is a real defect in the coagulation mechanism in thrombocytopenic purpura, in the presence of normal coagulation.

The conditions of hypoprothrombinemia are confusing because of the existence of several various components of the prothrombin complex. At present, data obtained from prothrombin consumption tests are too difficult to interpret to be of clinical value.

Of greatest value has been the light shed on the role of fibrin in the hemostatic mechanism. The evolution of the new prothrombin consumption test has followed the demonstration that fibrin is the most important physiologic antithrombin. It adsorbs thrombin readily, preventing its accumulation and its labilizing action on platelets.

The release of serum by clot retraction probably does not occur in vivo as it does in vitro. The hemostatic phenomenon in vivo is envisioned as a process including platelet accumulation and agglutination, release of thrombin, fibrin formation, and vasoconstriction (due to a platelet factor). The fibrin plug is more than a mechanical plug. It also is a means of checking the coagulation reaction.

LEONARD D. ROSENMAN, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Five Years of Postoperative Prophylactic Treatment with Dicumarol. Statistical Survey. (Fuenf Jahre postoperative Dicumarol-Prophylaxe. Eine statistische Bilanz). E. REHN and TH. HALSE. *Deut. med. Wschr.*, 1949, 74: 1552.

In this very interesting article the authors discuss the theories concerning the genesis and mechanism of postoperative thrombosis and embolism, and report the experiences with dicumarol from 1945 to 1949 at the Surgical Department of the University Hospitals at Freiburg, Germany.

Although initial treatment with heparin followed by the oral administration of dicumarol is the best method from the theoretical point of view, most of the authors' patients were treated with dicumarol only when heparin was not available in Germany for most of the period.

Partly because of the insufficient supply of dicumarol and partly for clinical reasons, the authors decided not to use the drug routinely after all operations but rather to apply it only when a rising prothrombin index indicated the danger of thrombosis. They emphasize that single tests are worthless and that the index must be taken daily for at least 12 days after operation.

Normally, the initial rise of the index immediately after surgery is followed by a sudden and considerable drop. If this fall of the index does not occur and the index continues on the same level or even keeps on rising, or if after the initial drop the curve rises again or wavers considerably, danger of thrombosis is present and prophylactic treatment should be started immediately. To illustrate the importance of daily testing, the authors mention that they observed several cases of severe thrombosis or fatal embolism occurring a day after a Sunday or holiday. Because of lack of laboratory personnel the taking of the test had been omitted on these days. The writers believe that the accidents could have been avoided if the test had been taken on the critical day.

Important as hyperprothrombinemia is as a sign of threatened thrombosis, one should not rely on laboratory tests alone but keep the patient under careful clinical observation. Slight elevations of the temperature and pulse rate, restlessness, pains in the calves and soles, or in the abdomen, may indicate beginning thrombosis even when the prothrombin index is normal.

For determination of the index the authors used the modification devised by Lehman in Sweden, which is much more sensitive than the original Quick method.

The success of the selective prophylactic treatment with dicumarol is quite impressive. During the period from 1930 to 1939, 28,118 operations were performed at the hospital with an incidence of 0.35 per cent for fatal embolisms and 1.46 per cent for thromboses. During the years from 1945 to 1949, 14,182 operations were done under prophylactic dicumarol treatment. The incidence for this period was 0.035 per cent for fatal embolisms and 0.25 per cent for thrombosis. Only 31 per cent of all the patients operated upon were treated prophylactically with dicumarol. The average amount used was 0.56 gm. per patient.

One advantage of selective as compared with routine dicumarol treatment is that the danger of hemorrhage inherent in dicumarol can be avoided in the majority of cases. In 69 of 4,411 patients treated with dicumarol, hemorrhages of all degrees occurred. Only 2 of these were fatal.

WERNER M. SOLMITZ, M.D.

Potassium Metabolism and Potassium Treatment in Surgical Patients. N. BLIXENKRONE-MØLLER. *Acta chir. scand.*, 1949, 99, 237.

Abnormalities of the potassium concentration may result in characteristic electrocardiographic changes. When the potassium loss is due to vomiting or diarrhea the serum potassium concentration is lowered and the excretion of potassium in the urine is diminished. On the other hand, when primary injury to the cells has occurred, potassium escapes from the cells to raise the serum potassium concentration, and the urinary excretion of potassium is likewise increased.

The author believes that in both groups of cases the administration of potassium is indicated. He studied the effect of potassium administration to patients with impaired kidney function and concluded that the administration of potassium is safe under these conditions; only in the presence of oliguria or anuria is it unwise to administer potassium. The author administers 600 mgm. of potassium ions per liter of fluid, totaling from 2,400 to 3,000 mgm. of potassium ions per 24 hours.

F. J. LESEMANN, JR., M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

That Strange Dangerous Malady—The Crush Syndrome. PHILIP B. PRICE, HUGH V. RIZZOLI, and STUART R. ELLIOTT. *West. J. Surg.*, 1949, 57: 569.

Prolonged crushing injury of the soft tissues of the extremities produces a strange, unique syndrome, a progressively serious set of interrelated pathologic changes which often lead to death. The authors have made a new attempt to elucidate these changes and unravel cause and effect. Much remains that they do not fully understand, but on the basis of what is known they have devised a simple plan of

treatment which, at least in dogs, seems to be relatively successful.

Their plan of therapy has been: (1) to begin therapy as soon as possible after release of pressure before serious renal and adrenal damage have had time to develop; (2) to provide or replace the water that so quickly escapes from the blood into the crushed tissues; (3) to replace the blood proteins that have been and will be lost from the active circulation; (4) to stimulate vigorous diuresis before the renal function has become seriously impaired and thus prevent, if possible, the development of oliguria; (4) to administer chemotherapy because of the very real danger of severe infection and bacteremia; and (6) to continue supportive treatment, as may be indicated, until physiologic functions return to normal and pathologic effects have been reversed and are being repaired. JOHN J. MALONEY, M.D.

Postoperative Paralysis in the Upper Extremity. Report of 5 Cases. M. R. EWING. *Lancet*, Lond., 1950, 1: 99.

The author reports a series of 5 cases of paralysis of the upper arm following various surgical procedures. While recovery was complete in all cases within a period of a few months, it is his impression that the number of such paralyses may be greater than is generally recognized and may even be on the increase. It has long been emphasized that nerve palsies are especially frequent after operations in which the patient has been placed in the Trendelenburg position. Four of 5 patients discussed by the author were placed in the Trendelenburg tilt during operation. In a majority of cases reported by several other authors the same is true.

While it is widely believed that the damage is caused by the direct pressure of an inadequately padded and incorrectly placed shoulder rest, tension and stretching are more important factors. The plexus is deeply placed at the base of the neck and is protected by tough fascial layers and fairly large muscle bodies. Furthermore, postoperative nerve palsies have been reported when the shoulder rests have not actually taken any of the body weight of the patient while on the operating table. It is certain that the Trendelenburg tilt combined with abduction at the shoulder and other factors is prone to produce nerve injury.

The nerve trunks of the upper extremity are anchored at their points of emergence from the vertebral column and also by their fascial attachments in the axilla. In consequence there is a limit to the amount of stretching they can withstand. With the arm by the side the stretching force may be considered to be greatest when the fingers and wrist are dorsiflexed, the elbow extended, and the forearm in full supination. Extension of the neck, or pulling of the head towards the opposite side, or both, may add tension.

When the humerus is abducted and rotated laterally, the humeral head forms a prominence in the axilla around which the nerve trunks must pass. In the Trendelenburg position, forcible pulling down of the shoulder girdle results. The steeper the tilt of the table and the heavier the patient, the greater is the force exerted. In a conscious patient this strain is counteracted by tonic contraction of the muscles of the shoulder, especially the trapezius and the rhomboids. In the anesthetized patient, however, the muscles are rendered flaccid and tension is exerted upon vulnerable nerve trunks. It is not unreasonable to suppose that curare and its derivatives increase the vulnerability of the nerve trunks to injury during the period of anesthesia.

When the Trendelenburg position is employed there is abduction of the shoulder girdle so that the acromion acts as a fulcrum pushing the humoral head still further downward into the axilla. Frequently the surgical assistant wedges himself against the abducted arm and increases the angle of abduction to more than 90 degrees. The anesthetist may add to the injury by forcibly extending and rotating the head and the neck.

Paralysis also follows operations in which the table has remained in a horizontal position. Dragging the patient's arm forcibly over his head, sometimes for convenience in feeling the pulse, and sometimes in order to get the limb out of the surgeon's way, may result in compression of the plexus between the clavicle and the scalene muscle or the first rib.

The author has endeavored to record his observations roentgenologically and also to verify his experiences with the surgical patient by examinations of, and findings in, cadavers.

In summary, it is important to avoid all tensions which predispose to plexus injury, such as forcible abduction of one or both arms when the patient is in the Trendelenburg position, especially if the operation is a long one. The hazards are increased by the use of curare and by the fact of the patient's being overweight. If necessary to bring the arm down from the side, whether for venoclysis or for blood pressure readings, care must be taken not to hold the arm in external rotation and with a fully extended elbow and supinated forearm. Hyperabduction of the arm particularly must be avoided. Manipulations while the patient is under full anesthesia, such as a sustained pull on the arm, even in the adducted position, are ill advised. Padding of the shoulder rests alone, however necessary, will not prevent paralysis. If these accidents should unhappily continue, it may be necessary to devise some method of utilizing the iliac crests as points of pressure, or of securing the thighs to the uprights of the leg supports.

KENNETH E. SHERMAN, M.D.

Acute Suppurative Tenosynovitis of the Hand. J. EDWARD FLYNN. *N. England J. M.*, 1950, 242: 241.

The incidence of acute tenosynovitis has been reduced markedly since the introduction of the antibiotics. These therapeutic aids have also reduced the incidence and severity of the complications of this type of infection. However, the author strongly dis-

approves of the treatment of acute suppurative tenosynovitis by any of the proposed means of local instillation of penicillin. Adequate incision of the entire sheath is still necessary and should be coupled with the parenteral administration of penicillin.

F. J. LESEMANN, JR., M.D.

Management of Patients with Tetanus. HAROLD E. GODMAN and JOHN ADRIANI. *J. Am. M. Ass.*, 1949, 141: 754.

The basic treatment of tetanus is that of prevention of extension of the disease, and neutralization of the toxins present. In order to prevent death after the disease has taken a hold, rigidity and spasm of the muscle must be controlled. Godman and Adriani experimented with a group of the more recent drugs in order to assess their value in this distressing disease.

Intravenous procaine hydrochloride with and without other agents was given with varied success. Barbiturates were found to be good sedatives, but ineffective in controlling muscle spasm and rigidity. Tribromethanol, when used without procaine, was found to be effective in doses of 50 mgm. per kilogram of body weight administered rectally. Curare was not always predictable in the amounts used, and because of the many disadvantages of the multiple dose method the drug was considered unsatisfactory. Mephenesin (tolserol) is a curarelike compound; it was employed in tablet form containing 250 mgm., and given orally. The doses used were either ineffective or produced severe respiratory depression. When administered with phenobarbital, the control of muscular rigidity and spasm was satisfactory.

The authors concluded that none of the agents proved entirely successful because of certain disadvantages in their use. STEPHEN A. ZIEMAN, M.D.

Coccidioidomycosis. The Hazard Involved in Diagnostic Procedures, with Report of a Case. JOSEPH M. LOONEY and TOBIAS STEIN. *N. England J. M.*, 1950, 242: 77.

A review of the literature on accidental infections caused by the handling of Coccidioides immitis cultures in the laboratory is presented. Eight cases of infection showing clinical manifestations, with 1 death, and 25 cases of infection as indicated by positive skin reaction are recorded in the literature.

A case of disseminated infection with Coccidioides immitis which was contracted during the handling of a culture in the laboratory is reported.

The danger of handling cultures of this organism in attempts to establish a diagnosis and the precautions to be taken are emphasized.

BENJAMIN GOLDMAN, M.D.

Natural History and Treatment of Pulp Space Infection and Osteomyelitis of the Terminal Phalanx. HAROLD BOLTON, P. J. FOWLER, and R. P. JEPSON. *J. Bone Surg.*, 1949, 31-B: 499.

Infection of the pulp space occurs with much greater frequency than more serious infections of the palmar space or tendon sheaths, and may cause prolonged incapacity. There is often residual disability due to stiffness of joints, fibrosis of the tactile pad, or "minor causalgia" with a cold, blue, shiny, and stiffened finger, aching pain of a "deep cold" quality, and tactile hyperpathia.

From the point of view of treatment, pulp space infections may be divided into three clinical groups: (1) simple felon; (2) suspected bony felon; (3) established bony felon. Simple felon is a pulp space infection limited to the soft tissues; with correct treatment it heals without complication. Suspected bony felon is one in which it seems probable that there is osteitis because there is persistent sinus formation, continued pain, massive sloughing, or evidence at operation of periosteal damage; and yet, radiographic confirmation is lacking. Established bony felon is one in which there is definite radiographic evidence of bone infection.

The conservative measures that are sometimes advocated can have little application to the treatment of patients who almost invariably have complained of pain for not less than 4 days before their first attendance at the clinic. In every case in this series, without exception, pus was found in the pulp space when it was explored. The correct treatment for infection of the pulp space is incision and the only question to be determined is which incision is best. For some time the authors have been dissatisfied with the lateral incisions that are used so generally. It is often found that a central pulp space abscess which has been opened widely by a J-shaped lateral incision, or bilateral straight incisions, continues to discharge through the overlying sinus, while the extensive lateral incisions close up and heal without serving any useful purpose after the initial evacuation of pus at the time of operation. Study of the pathology of these lesions indicates that a local abscess should be drained through the skin immediately overlying it rather than by means of oblique incisions which traverse uninfected pulp tissue and are quickly narrowed by edema. Moreover, it is evident that "minor causalgia," which gives rise to lasting incapacity in about 2 per cent of pulp space infections, is due to injury to the digital nerve caused by a lateral incision. Anatomical studies make it clear that with lateral incisions it is largely a matter of chance as to whether or not the digital nerve will be severed. On the other hand, small incisions placed directly over the abscess will not damage the nerves which are displaced laterally.

Certain points in the technique are important. The site of greatest tension and tenderness should first be localized with precision by palpation with a blunt probe. Localization is made easy if there is a spontaneous sinus because the sinus always lies directly over the abscess cavity. Sometimes pus has extruded only through the true skin, lying imprisoned beneath unbroken squamous epithelium and thus forming a collar-stud abscess. General anesthesia and a pneumatic tourniquet by which to secure a bloodless field are essential if the abscess is first

excised. The small sinus, which can then so often be demonstrated in the true skin, is excised elliptically over a length of 4 to 5 mm., the axis being transverse for central abscesses and longitudinal for lateral abscesses. The circumscribed abscess cavity, seldom measuring more than a few millimeters in diameter, is then revealed. The cavity is filled with penicillin in lactose powder. No drainage is required because the cavity lies "saucerised" to the surface. The wound is dressed with broad-mesh vaseline gauze and an outer layer of dry gauze. In uncomplicated lesions, 2 or 3 similar dressings at three-day intervals will suffice. The cavity quickly collapses and the incision heals in not more than 10 or 12 days. The scar is small and inconspicuous and the pulp is functionally unimpaired. Immobilization of the digit is very occasionally needed because there is infective arthritis of an interphalangeal joint, or the whole limb may need to be immobilized because of lymphadenitis; but in all other cases active movements are encouraged at once.

Fifty unselected cases of pulp space infection have been studied. In every patient an abscess was found at operation, the situation being either superficial, deep, lateral, or central. The healing time was calculated from the day of first attendance to the day of discharge from the clinic with a healed wound. The incidence in men and women was approximately the same. The thumb and index finger were the digits most commonly affected. Twenty-six patients attributed the lesion to a cut or injury. When bone infection was suspected or proved, penicillin was given intramuscularly in doses of 100,000 units twice daily for 10 to 14 days; in most of these patients there was some limitation of movement of the terminal interphalangeal joint at the time of discharge from the clinic. Only 5 patients in the whole series of 50 complained of a tender scar during the first few weeks after healing, and none developed causalgia.

The average healing time for simple felon was 11½ days, for suspected bony felon, 25 days, and for established bony felon, 35 days.

BENJAMIN GOLDMAN, M.D.

Aureomycin in Soft Tissue Infections. MYRA A. LOGAN, WILLIAM I. METZGER, LOUIS T. WRIGHT, AARON PRIGOT, and EDWIN A. ROBINSON. *Am. J. Surg.*, 1950, 79: 229.

A clinical study of aureomycin is presented in order to note the effects of the antibiotic when administered by various routes, namely, orally, intramuscularly and intravenously.

Aureomycin was used in 82 surgical infections of the soft tissues, which consisted of the following groups: cellulitis, perirectal infections, peripheral ulcers, lymphadenitis, traumatic cases, and gas gangrene infections. The organisms causing the infections were a variety of gram positive and gram negative bacilli and most of them were staphylococci or beta hemolytic streptococci. Miscellaneous infections included a case of bacteriemia caused by paracolon bacilli and one caused by the S. minus. In the authors' hands, aureomycin yielded satisfactory results in the treatment of these infections, whether used alone or as an adjunct to the indicated surgery. The chemical course of the infections treated was shortened by the use of aureomycin, for example, in the cases of lymphadenitis. In other infections, such as cellulitis, the usual rate of surgical intervention was markedly reduced during the use of this drug. Early definitive surgery was made possible by the use of aureomycin in perirectal infections by the reduction of local infection.

It has been the author's conclusion that aureomycin should be used in the field of soft tissue infections and can be given either orally, intramuscularly, or intravenously. Blood level studies and "in vitro" sensitivity tests were performed, and confirmed the clinical results. There was no resistance of the patients to the drug in cases in which prolonged administration was necessary. No serious clinical signs of toxicity were seen as a result of drug administration.

JOHN E. KARABIN, M.D.

ANESTHESIA

Increase or Decrease of Local Anesthesia and Calcemia. Study of Atophan and Its Thiophenic Isologues (Renforcement ou diminution de l'anesthésie locale et calcémie. Etude de l'atophan et de ses isologues thiophéniques). ANDRÉ QUEVAUVILLER. *Anesthésie*, Par., 1949, 6: 300.

The author shows that the anesthesia of the cornea of the rabbit obtained by cocaine is increased by atophan and by its thiophenic derivative when strong doses are used (0.25 and 0.35 gm. per kilogram). With smaller doses (0.15 gm. per kilogram) there is a decrease of the anesthetic action. These phenomena are more marked with the sulfur derivative, and this seems to be due to the fact that the thiophenic nucleus enhances the permeability of the cells for the analgesic; they are connected with changes in the equilibrium of the tissular calcium since the synergic doses cause hypocalcemia and the antagonistic doses, hypercalcemia. These two phenomena are interrelated and the first can explain the second. Indeed, it has been demonstrated that the ion displacements of the blood result from inverse displacements of the ion equilibrium of the central nervous system. During sleep there is a decrease in the calcium of the blood plasma, while in excitation there is increase in the calcium of the plasma; better still, if by intracerebral application of calcium a narcotic effect is produced, the calcemia falls. Thus, a hypocalcemia denotes an increase in the calcium content of the nervous tissue, and a hypercalcemia a decrease. And it is known that an increase in the calcium content of the nervous tissue is accompanied by a decrease in its excitability, and vice versa. Consequently, the changes in the nerve endings are related to a mobilization of their tissular calcium

This action of the analgesic and antipyretic substances of the atophan type must be compared to that

of the hypnotics such as morphine and that of the analeptics, such as caffeine. Some investigators have observed that calcium reinforces the cocaine-morphine synergy and that this synergy disappears during experimental habituation to morphine which is accompanied by a considerable mobilization of the tissue calcium. Besides, the hypothesis has been advanced that there is a correlation between the sedative action of morphine and the hypocalcemia observed in the rabbit under the influence of nonlethal doses of this drug. The same authors have also found a hypocalcemia under the influence of caffeine which reinforces the anesthetic action of cocaine. The connection between these phenomena of potentialization of local anesthesia and the mobilization of cellular calcium is even more evident in the experiments of Quevauviller in which the two phenomena are seen to change in one way or the other according to the dosage of the same product.

RICHARD KEMEL, M.D.

Intravenous Anesthesia with Sodium Kemithal (Anesthésie intra-veineuse au kémithal sodique). GEORGES JACQUOT, MARCEL ROUX, and PIERRE HUGUENARD. *Anesthésie*, Par., 1949, 6: 279.

Kemithal is the sodium salt of 5-delta 2:3-cyclohexenyl-5-allyl-2-thiobarbituric acid, which is a pale yellow powder that is rapidly soluble in water up to 20 per cent; its 10 per cent solution has a *p*H of 10.6 and is stable for 24 hours if it is protected against air. It is about 50 per cent less powerful than pentothal and slightly less powerful than evipan, but its safety margin is relatively higher than that of these two drugs; the duration of action for equivalent doses is about the same for the three drugs. Its action on the arterial blood pressure is the same as that of pentothal, but it causes less respiratory depression. It is nearly completely destroyed in the organism, at the rate of 2.5 per cent of the initial dose per minute; 2 per cent of the drug is found unchanged in the urine of rabbits, and 1 per cent in the urine of man. The curves of destruction of evipan and of kemithal run practically parallel. No histologic lesions have been found in any organs of rabbits which have been given 50 mgm. of kemithal daily for 2 weeks.

In man, kemithal has been used intravenously in 5 or 10 per cent solutions with equal success. Premedication does not differ from that used with other intravenous anesthetics. The intravenous route produces anesthesia with a single dose or prolonged anesthesia with repeated injections or perfusion. For a short anesthesia the dose is 0.50 and 1.50 gm. Induction is smooth, agreeable, and without incident; it requires from 20 to 30 seconds. This single dose may be used to start anesthesia that is continued with an inhalation agent. If multiple doses are used to obtain an anesthesia of undetermined duration, from 10 to 20 cgm. of kemithal are administered every time this is found necessary, according to the condition. A 1 per cent solution in physiologic serum has also been used for perfusion to keep up the anesthesia; the average dose of the drug used was 1 gm. per hour and the maximal dose was 7 gm. in 2 hours. Under deep anesthesia the respiratory center seems to keep its power of responding to stimulating doses of carbon dioxide. Laryngospasm is less to be feared than with the other barbiturates, especially pentothal. Many patients with hepatic disease have received kemithal without any deleterious effect.

Muscular relaxation varies with the dose used; it is usually satisfactory for operations on the abdomen and the pelvic organs. Relaxation of the jaw facilitates tracheal intubation. Experimentally, kemithal has been combined with d-tubocurarine in 40 cases; the dose of anesthetic could be reduced by one half. The time of return to consciousness depends on the type of patient, the premedication, the duration and seriousness of the operation, and the total dose given; it occurs generally without incident and there is less tendency toward agitation than with the other barbiturates. Accidental subcutaneous injection of the 10 per cent solution rarely causes serious local reaction. Thrombosis is no more frequent than with other barbiturates. Satisfactory results have been obtained by the rectal administration of 3 gm. of kemithal in 60 c.c. of water 45 minutes before operation.

The author has used a 10 per cent solution of kemithal in water or in subtosan, in 28 patients with highly satisfactory results, whether it was used alone or in combination with nitrous oxide oxygen or with ether.

RICHARD KEMEL, M.D.

Massive Pulmonary Collapse Following Anesthesia with Curare. R. FOREGGER, H. RETTIG, and CONDE CONROY. *Wisconsin M. J.*, 1949, 48: 1004.

A 56 year old woman suffering from hypertension underwent an operation for the relief of partial intestinal obstruction due to adhesions. The induction and maintenance of anesthesia were with cyclopropane, using the endotracheal absorption technique. A moderate amount of ether was administered for 5 minutes following induction. At the commencement of operation, curare, 3 c.c. (intocostrin), was administered. Within a period of 3 minutes, the respirations ceased and artificial respiration was started. The operation consisted of lysis of intestional adhesions and it was completed in 1½ hours. At this time the patient had a good color, the pulse was strong, with a rate of 84, and the blood pressure was 160/90. Artificial ventilation was carried out with oxygen for 8 hours. It was necessary to maintain vigorous artificial respiration with pure oxygen to prevent arterial anoxemia.

Some resistance to inflation of the lungs was experienced throughout the entire period of artificial ventilation, but at one time it became extremely difficult to inflate the lungs. Bronchial rales were heard on auscultation but no mucus could be aspirated from the trachea. Accordingly 1 c.c. of adrenalin was given intravenously. Immediately it became easier to inflate the lungs and the bronchial rales disappeared, but this effect was only transitory

and soon again inflation of the lungs required as much force as before the administration of adrenalin.

At autopsy, bilateral pulmonary collapse was found, with no evidence of tracheobronchial obstruction. The history and physical findings did not offer any evidence of myasthenia gravis. No completely satisfactory explanation for the prolonged curarization and the massive pulmonary collapse could be made, but it was considered that in some manner they are most likely related to the administration of curare.

Oxygen and Carbon Dioxide Content of Arterial Blood Before and During Spinal Analgesia. KENNETH E. LATTERELL and JOHN S. LUNDY. *Anesthesiology*, 1949, 10: 677.

Oxygen saturation of arterial blood during spinal analgesia is of great concern to the anesthesiologist. The oxygen saturation of arterial blood of 25 patients during routine spinal analgesia was determined by the Van Slyke method from samples of arterial blood, and continuous observation with the Millikan oximeter. Observations were as follows:

1. The changes in oxygen saturation of arterial blood associated with routine spinal analgesia were usually relatively small. On the average the maximal decrease in oxygen saturation was only 1 per cent with a range of −9 to +4 per cent over an average period of observation of spinal analgesia of 63 minutes.

2. The carbon dioxide content of arterial blood during spinal analgesia was found to be within normal limits.

3. Paralysis of the intercostal nerves due to spinal analgesia probably is compensated for by increased excursion of the diaphragm.

4. Nausea during spinal analgesia was found not to be associated with a decrease in oxygen saturation of arterial blood.

The effect of premedication on oxygen saturation of arterial blood was investigated in a series of 8 surgical patients and 2 normal subjects. Variations ranged from an increase of 2 per cent to a decrease of 4 per cent from the accepted normal saturation of 97 per cent. In no instance was there any evidence of a significant degree of hypoxemia.

The Brain, and the Symptomatology of the Anoxias. H. E. HIMWICH. *Anesthesiology*, 1949, 10: 663.

The review presented supports the viewpoint that metabolic inhibition is only a part of the phenomena of anesthesia; therefore, the fact that anesthesia is more than metabolic inhibition is taken into consideration. With metabolic deprivation as seen in anoxia, cyanide poisoning, and hypoglycemia, the brain ceases to function because it is deprived of the energy to carry on.

If the metabolic rate of the nervous system exhibits a quantitative gradient along the neuraxis, it must follow that not all parts of the brain will be equally affected by anoxia, but that those regions with the highest rates would succumb first and those with the lowest, last. In conditions due to metabolic deficit other than those produced by anoxia, the presenting signs remind one strongly of those produced by acute anoxia. The metabolic inhibition is the cause for the march of the signs down the neuraxis with deepening anesthesia.

In anesthesia, not only is there some inhibition in the energy transfer, but specific effects are exerted upon the functioning of various nerve areas and an important one is the elevation of the synaptic threshold. To this, and to other specific effects are attributed the differences between pentothal and ether, for these specific properties render each anesthetic unique in its action. That should not blind us to the possibility that one element of this complicated picture is a metabolic one, common to all anesthetics which work through their effects on the brain. Such a metabolic element yields an explanation for the stepwise passage in the allocations of the signs down the neuraxis and also affords a basis upon which the specific effects of each anesthetic agent may be superimposed.

CLAYTON M. BRODINE, M.D.

The Relationship of Various Anesthetic Agents to the Action of Pituitrin, Pitressin, and Pitocin. CARLOS P. PARSLOE, LUCIEN E. MORRIS, and O. SIDNEY ORTH. *Anesthesiology*, 1950, 11: 76.

Side effects following the administration of preparations from the posterior lobe of the pituitary gland have been reported in the recent literature. The untoward effects have been observed in both the conscious and anesthetized patient. They have varied from socalled "pituitrin shock" to death of the patient. Complications have been listed as (1) respiratory—laryngospasm, bronchospasm, bronchorrhea, and massive pulmonary collapse, or (2) circulatory, with signs of pulmonary edema and peripheral collapse. They are thought to be attributable to (1) a manifestation of an anaphylactic reaction to pituitrin or (2) a result of coronary constriction with concomitant hypoxia of the heart muscle, cardiac dilatation, and decreased cardiac output.

Since accidents have occurred following the administration of pituitary preparations to the anesthetized patient, the re-evaluation of the pharmacologic actions, the therapeutic uses, and possible incompatibilities have been subjected to further study. The drugs studied were pituitrin, pitressin, and pitocin. Twenty-six dogs were used in 84 experiments. Both anesthetized and unanesthetized dogs were subjected to the experiments. The anesthetic agents were cyclopropane, ether, chloroform, nembutal, chlorotone, and procaine. The dosages were: pituitrin, 1 unit per kilogram of body weight diluted to 5 c.c., and injected intravenously during an interval of 50 seconds; pitressin, 2 units per kilogram of body weight; and pitocin, 1 unit per kilogram given in like manner. Electrocardiographic tracings were recorded with the three standard leads in all experiments, and direct blood pressure recordings were

made in the majority of them. A combination of pituitrin and epinephrine, from 5 to 10 gamma per kilogram, was used in some experiments.

The authors reported the following findings:

1. Marked falls of the blood pressure usually were produced by pituitrin or pitressin administrations during anesthesia with agents used in this investigation.

2. Epinephrine caused the return of blood pressure to normal levels.

3. There was evidence of peripheral and coronary circulatory insufficiency, which in a damaged heart might lead to accident—particularly if the added factor of hypoxia from some other cause already existed or occurred concomitantly.

4. Cardiac irregularities were produced by pituitrin and pitressin in all of the conscious animals and in a large percentage of lightly anesthetized animals.

5. Irregularities were infrequent during deeper anesthesia, although a slowing of the pulse almost always was caused.

6. After pituitrin injection, epinephrine is not likely to cause ventricular tachycardia. Ordinarily, epinephrine would cause tachycardia practically routinely during cyclopropane anesthesia in the dog.

7. Pitocin does not produce any marked deleterious effects with respect to the blood pressure or cardiac rhythm.

Various authors have reported various reactions to preparations of the posterior pituitary lobe in different species. Therefore, caution should be exercised in transferring the aforesaid findings to man, although a working concept can be formulated from laboratory procedures. The following conclusions have been drawn from the experiments described:

1. Pituitrin causes coronary constriction with potential myocardial hypoxia.

2. Pituitrin and pitressin may cause a generalized hypoxia due to respiratory modification or stimulation of the gastrointestinal tract contractions.

3. Cardiac dysfunction during anesthesia is more likely because of possible pre-existing myocardial hypoxia.

4. Side effects are more marked in the unanesthetized and lightly anesthetized animals.

LUCILLE WATT, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Clinical Trial of Occlusive Plastic Dressings. R. S. F. SCHILLING, MARY ROBERTS, and NANCY GOODMAN. *Lancet*, Lond., 1950, 1: 293.

A waterproof occlusive dressing has many advantages in industrial first aid; however, its advantage in preventing contamination of industrial wounds is offset by the great tendency of the covered skin to become macerated, to gape, and to exhibit delayed wound healing. A new type of occlusive dressing has been developed with a nylon derivative film base, which has been proved to be an effective barrier against the ingress of bacteria, but at the same time is readily permeable to water vapor and thus prevents the maceration of the underlying skin. A controlled clinical trial of this dressing in the treatment of minor industrial wounds demonstrated clearly its superiority over the ordinary occlusive dressing.

F. J. LESEMANN, JR., M.D.

Plastic Surgery and Industrial Accidents (Plastická chirurgie a úraz). FRANTIŠEK BURIAN. *Lék. listy*, 1949, 4: 457.

The author is the head of the department of plastic surgery at Charles University in Prague. As he was encouraged by the results which he had obtained with early plastic operations in accident cases during the past years, he feels emboldened to recommend that every surgeon doing emergency work be schooled in the principles of plastic surgery, and that surgeons in general acquaint themselves with at least the rudiments of the art, such as the proper use of the dermoepidermal cutaneous transplant as a provisory measure. This form of skin transplant should be attempted whenever the tissue loss is too great for immediate suture and when the general condition of the injured patient does not permit definitive plastic repair of the defect. Such temporary cutaneous covering will prevent secondary infection of the wound surface, will shorten the period of healing, and will forestall the deformity resulting from healing of the wound by the open granulation process, a deformity which would render the later plastic repair more difficult.

In this report the author limits himself to a discussion of industrial injuries in the regions of the head and the hands, and does not include heat or chemical burns or injuries resulting from the action of an electric current. Nor does he discuss the many minor reparative procedures which in themselves constitute an entire section of surgery.

The interval permissible between the instant of the injury and the initiation of the plastic repair work varies from case to case and is different for different parts of the body. Under the most favorable conditions in wounds of the hand the interval may amount to 4 hours; under unfavorable circumstances this should be shortened to 2 hours. In face wounds the extensive plastic procedures may be put off for periods of from 12 to 24 hours; under unfavorable conditions, however, this should be shortened to 6 hours. Under very favorable conditions such work may be put off for 48 hours or even longer. This time interval will, of course, be largely affected by the presence or absence of wound contamination; however, industrial injuries, dirty and greasy as they look, are frequently surprisingly clean of pathogenic bacteria. The injury with the butcher's instruments is to be feared and farm injuries are bad because of tetanus and gas bacillus infections. Most of the staphylococcic and streptococcic infections are secondary and are frequently introduced with the first aid care of the wound. Of course, débridement should be practiced in the badly devitalized and apparently contaminated wound. This débridement may be as extensive as wished on the extremi-

ties, but in face wounds such removal of tissue should be minimal in order to produce more resistance to infection and to trophic nervous sequelae.

In simple cuts the repair should be done under local infiltration anesthesia when possible. The injection of the anesthetic fluids in and around the wound edges is in itself a defense against infection, since these fluids tend to wash the fine dusty contaminants out of the tissues. The anesthetic fluid may, of course, contain penicillin, and the general administration of sulfonamides and penicillin should never be neglected. In wounds involving the sensitive pulp of the finger tip, the local tissues should be utilized for the repair whenever possible. Accessory incisions should be carried transversely and the required flap moved around from the lateral surfaces, or even from the dorsal aspect of the finger. Transplants transferred from a distance will never develop the selective sensory capacity of the local tissues.

In more extensive injuries of the hand, especially those in which the tendons are exposed, succor must be prompt, or in from 4 to 8 hours. This will usually consist in burying the injured parts in pockets or bridges produced in the skin of the abdominal wall.

In wounds of the face careful search should be made for perforations into the mouth, sinuses, or nasal passages; however, in complicating fractures of the bones there must be no hesitation in opening up the area of the fracture and fixing the bone fragments with fine rustless steel wire when this is required. In the fractures of the lower border of the orbital cavity, which may result in a sinking down of the eyeball on the involved side and interference with binocular vision, the sinus may be opened and packed with medicated gauze to hold up the fragment. The pack may later be removed through a hole chiseled into the nasal cavity.

In the scalping wounds of industry, the original skin covering of the skull surface may be fastened back; however, in this case all of the fatty tissues should be scraped away and the hair carefully shaved away. If the galea aponeurotica be lost with the hair, in addition to the usual dermoepidermal graft, the outer bone cortex of the skull should be chiseled away to expose the diploe. Of course, frequently this extreme procedure cannot be done, in which case it is perhaps better to leave the bone surface uncovered until (after 2 or 3 days) the outer surface of the cranial bones begins to flake away spontaneously. It is believed that this process may be continued (with advantage) until the bone surface is entirely covered with granulation tissue.

JOHN W. BRENNAN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Roentgenologic Study of the Cerebral Cisternae in Pathologic Conditions (Studio radiologico delle cisterne cerebrali in condizioni patologiche). GUIDO LOMBARDI. *Radiol. med.*, Milano, 1949, 35: 763.

Every conclusion stated by the author is clearly shown by 31 photoroentgenograms which accompany his 23 brief case histories. The method of study, which has been worked out in the Roentgenologic Department of the Institute of Neurology of Milan, Italy, is designated "fractionated cisternography," or, when it is judged advisable to follow it with encephalography, "fractionated cisternoencephalography."

The application of this technique to the study of the pathologic conditions about the sella turcica is especially advantageous. As a fact, the method permits of solving diagnostic problems in this region, or of confirming the clinical diagnosis in the guise of a reconstruction in vivo of the anatomopathologic picture. In tumors of the sellar region, the location, dimensions, direction of growth, and relationship to the ventricular cavities may be demonstrated. Such evidence cannot be furnished by clinical and ocular data except as a mere approximation.

In clinically doubtful cases it is possible to differentiate between tumors and inflammatory processes by means of cisternography. In the neoplasm there is protrusion which narrows the lumen of the cisterna locally, while in the inflammatory process, such as arachnoiditis opticochiasmatica, there is an irregular form of reduction of the lumen. In either case complete obliteration of the basal cisternae may occur, when, in addition to the clinical data, the differentiation will depend upon the condition of the sella turcica itself, which is usually intact in inflammatory processes. This same consideration will apply also to the condition of the third ventricle, which tends to remain unaltered in arachnoiditis but is usually deformed by tumor. Of course, the precise nature of the obstruction cannot hereby be recognized; the eosinophile and chromophobic adenomas, aneurysms, and craniopharyngiomas produce cisternal deformations which cannot be differentiated. Here, again, roentgenologic study of the sella is indicated. In a large proportion of the craniopharyngiomas there is seen, in addition to the bony alterations about the basi sphenoid (which may be absent), evidence of suprasellar calcification. In the parasellar localizations there is apt to be found a unilateral involvement of the sella itself, its clinoid process, the floor of the middle fossa, and the ala parva of the sphenoid, and the presence of a lamellar type of calcification may be seen in cases of aneurysm. In cases of meningioma of the tuberculum sellae turcicae, and of the clinoid processes, especially pronounced changes (eburnation) are apt to be found in the basisphenoid. Gliomas of the chiasm tend to produce an omega type of deformity of the sella turcica. Since surgical intervention in cases of aneurysm of this region is useless and frequently fatal, there is no indication to pass at once to the method of arteriography every time a doubt as to the presence of aneurysm arises.

In the opticochiasmatic form of arachnoiditis, cisternography will confirm the clinical diagnosis and will differentiate between the productive and nonproductive forms; however, the absence of cisternographic findings will not exclude the presence of organic changes, nor of operative indications.

In cases of chronic communication hydrocephalus, cisternography will not only confirm the diagnosis but will also provide therapeutic indications, or lack of indications, since it will reveal the type of hydrocephalus due to basicisternal adhesions, as postulated by Dandy.

Except in the cases cited, the findings of cisternography in this region will have little significance and will be subservient to any means of determining the basic cause of the process.

Study of the cisternae other than those in the region of the sella is of much less importance. This is due in large measure to the fact that it is difficult to get air into these cisternae even in the normal state, and much more so in the pathogical state, because of their deep location and because they are more susceptible to the blocking effects of cerebral edema. The tumors and other space-constricting conditions of subtentorial location are contraindications to the ordinary methods of air insufflation and the fractional method here cited does not entirely remove the restrictions. In cases of atrophic or congenital smallness of the cerebellar lobes careful cisternography is indicated; however, this field of study has hardly been touched as yet. In the lesions of the cerebellopontine angle and those in the region of the pontomesencephalon cisternography may be indicated, provided the patient can tolerate the introduction of the minimum of air required. This method is particularly important because of the demonstration of the cisternal surroundings, and may permit the detection of conditions which would otherwise not be found in the ordinary roentgenologic methods of examination.

Of course, any of these cisternae may at any time, by their deformity or displacement, provide valuable information as to the direction of growth of a tumor; however, such information is of little moment in most of these cases when compared with that to be obtained by ventriculography. Nevertheless, such information should be carefully noted when available, as it will lead to an exact interpretation of every deviation from the normal and aid extremely reliable reconstruction of the entire roentgenological picture. JOHN W. BRENNAN, M.D.

The Relation of the Sella Turcica in Pathologic Intracranial Processes (Das Verhalten der Sella turcica bei pathologischen endokraniellen Prozessen). REINHOLD LORENZ. *Fortsch. Roentgenstrahl.*, 1949, 72: 20.

The author reviews 490 pictures taken of the sella turcica, 290 of which had abnormal outlines of position. He thus arrived at a normal curve, or size-range table.

The influence of size and type of tumors giving rise to an enlarged sella turcica was undertaken in the study. It is shown, also, that the size of the tumors has an influence on the degree of sella enlargement. This is elaborated upon by means of several case histories.

The effects of the tumors on the sella turcica, as tabulated, can be associated with changes in the ventricular system. Alterations in the sella turcica are related to the types of tumor present, such as primary brain tumors and metastatic or aneurysmal growths. Hematomas do not lead to sella turcica changes.

In pathologic review, the author found the sella to be enlarged in only 5 per cent of the cases; the possibility of an enlarged sella in association with a predisposition to tumor is mentioned.

The study shows that consideration of the position of the sella turcica and of its roentgen shadow boundaries may be a great help in the diagnosis of intracranial lesions. JANE C. MACMILLAN, M.D.

Roentgen Demonstration of Displaced Intracranial Physiologic Calcification and Its Significance in the Diagnosis of Brain Tumors and Other Space-Occupying Diseases. BARTON R. YOUNG. *Radiology*, 1949, 53: 625.

The roentgen demonstration of physiologic intracranial calcifications is an important diagnostic aid in the recognition and evaluation of space-taking lesions within the cranium. Calcification occurs in the pineal body more frequently than in other intracranial structures, and for this reason an attempt should always be made to demonstrate the gland. Posteroanterior, occipital, and lateral views should be taken, and the author has found that stereoscopic views are frequently more informative than single views. Normally the pineal body is situated midway between the sides of the cranium, and displacement of this structure from the midline, of more than 2.5 mm., indicates significant intracranial abnormality. Various methods of determining a shift of the pineal body as seen in the lateral view are also described.

A significant shift of the pineal body may be due to the following disorders, which are arranged according to their relative frequency, the most frequent being listed first: glioma, meningioma, metastatic tumor, hematoma (both subdural and intracerebral), subdural hygroma, brain abscess, cyst, and granuloma.

The incidence of calcification in the choroid plexuses of the lateral ventricles before the age of 50 is low, and frequently the calcification is asymmetrical and unilateral. For these reasons physiologic calcification of these structures is not as good as calcification of the pineal body in determining space-taking lesions within the cranium. However, a marked change in position of a well calcified choroid may be suggestive of tumor, and should be evaluated in relation to clinical and other roentgen findings.

Physiologic calcification in the falx is usually manifest as a few small plaques near the vertex, and for this reason is seldom useful in the determination of a space-taking disorder. When an extensive sheathlike calcification of the falx is present and shows displacement, it may be helpful in making a diagnosis. Physiologic calcification in the dura is usually linear with sharp margins, whereas calcification secondary to a meningioma usually has fuzzy borders. JOHN W. HOPE, M.D.

Eighth Nerve Tumors: Their Roentgen Manifestations. PHILIP J. HODES, EUGENE P. PENDERGRASS, and BARTON R. YOUNG, *Radiology*, 1949, 53: 633.

Eighth nerve tumors account for about 6 per cent of all intracranial neoplasms. Because they are particularly suited to surgical removal, their early recognition is essential. The records of 129 patients with proved eighth nerve tumors were, therefore, reviewed in an effort to summarize the roentgen manifestations.

That the roentgen anatomy of the petrous pyramid varies considerably has been appreciated by men interested in acoustic tumors. The problem of differentiating between an anatomical variant and an early acoustic tumor, therefore, is an extremely difficult one.

The bone changes seen roentgenographically in acoustic tumors are probably due to the combined effects of direct bone pressure, and indirect pressure upon the aqueduct of Sylvius. The direct bone pressure may be observed with any cerebellopontine angle tumor, but the effects of pressure upon the aqueduct of Sylvius are less specific. An attempt was made to determine which view of the head gave one the most information concerning eighth nerve tumors. It was found that the occipital view was most informative in 48 per cent of the cases, whereas the posteroanterior view was most informative in 37 per cent of the cases. Whereas 85 per cent of the tumors were recognized most readily in the anteroposterior and posteroanterior projections, it must be remembered that unless complete routine examinations are done in patients with suspected eighth nerve tumors, 15 per cent of the tumors will be overlooked.

It was noteworthy that in 85 per cent of the patients, the lateral view of the head revealed evidence of increased intracranial pressure.

For purposes of description, the roentgen manifestations of eighth nerve tumors were divided into six groups:

Group 1. No roentgen abnormalities noted in the petrosa (10%).

Group 2. Slight deossification of the internal auditory canal as the only roentgen finding (6%).

Group 3. Wide, but not short, internal auditory canals (26%).

Group 4. Short and wide internal auditory canals, which in many instances were actually funnel-shaped (36%). This was the largest group.

Group 5. Complete destruction of the internal auditory canal, although the petrosal pyramids were still visualized roentgenographically, albeit considerably demineralized (8%).

Group 6. Complete destruction of the internal auditory canal and the mucosal apex (14%).

This article contains 68 illustrations which help considerably in clarifying the text.

Tracheoesophageal Constriction Produced by the Right Aortic Arch and Left Ligamentum Arteriosum. EDWARD B. D. NEUHAUSER. *Am. J. Roentg.*, 1949, 62: 493.

In 1946 Gross and Ware, and the author, presented two articles, based on studies at the Children's Hospital of Boston, giving a working classification of the anomalies of the great vessels at the base of the heart. At that time little attention was paid to the ductus Botalli, although, as has been found later, this structure may well produce symptoms.

The author now suggests the following partial classification of aortic arch anomalies:

Right aortic arch without visceral inversion.

1. Anterior type arch is anterior to the trachea, descending on the right:
(a) associated with right ductus Botalli;
(b) associated with left ductus Botalli.
2. Posterior type arch passes to the left behind the esophagus and descends on the left, or just right of its normal left-sided position:
(a) this may be associated with a persistent left aortic diverticulum giving origin to the left subclavian and ductus Botalli;
(b) the left subclavian may arise from the right arch and pass behind the esophagus.
3. Left aortic arch descending on the right (Paul):
(a) associated with right ductus Botalli (Edwards);
(b) associated with left ductus Botalli.

In the present article the author discusses 5 cases of right aortic arch with left ligamentum arteriosum, in which there was a tracheoesophageal constriction with symptoms of severe stridor and dysphagia. The constriction was the result of pressure from the ligamentum arteriosum which passed from the pulmonary artery to the left of the trachea and esophagus, and then behind the esophagus to join the thoracic aorta on the right side just below the level of the aortic arch. The most remarkable thing about these 5 cases is the fact that surgical division of the ligamentum arteriosum and freeing of the vascular structures, performed by Robert E. Gross, led to complete relief of the stridor and dysphagia. It is believed that these are the first instances of such a procedure.

In 4 of the 5 patients, whose ages ranged from a few months to 10 years, the correct diagnosis was made on the basis of the roentgen findings and confirmed at operation. The fifth patient had a tetralogy of Fallot with a vascular ring produced by a right aortic arch and a right descending aorta, and a ligamentum arteriosum passing from the left pulmonary artery to the right aorta. Up to the present time, no operation has been carried out on this patient.

The roentgen examination consists of simple fluoroscopy, outlining of the esophagus with barium mixture, and lipiodol instillation of the trachea. In 2 of the author's cases, angiocardiography was also done. The fluoroscopy shows that the major mass of the aorta and aortic arch is on the right side of the midline. The barium-filled esophagus exhibits a shallow but definite indentation on the right side from pressure of the right aortic arch, best seen in the anteroposterior projection and in the left anterior oblique view. In addition, there is a definite extrinsic filling defect about 0.5 to 1.0 cm. in size on the posterior aspect of the esophagus, at or just below the level of the aortic arch. Since no abnormal pulsation is seen this defect cannot be attributed to the aortic arch itself, but is the result of pressure from the ligamentum arteriosum. At the same level, often there is also a very shallow indentation of the left side of the esophagus. The lipiodol instilled trachea shows in the anteroposterior projection a definite, rather prominent defect on the right side. Angiocardiography is of value, especially in revealing the reversal of the aortic arch branches so that the innominate artery arises as the first branch and divides into the left subclavian and left common carotid, while on the right the two vessels emerge from the aortic arch separately. It is, however, not required to establish the correct roentgen diagnosis.

The anomaly most apt to come into consideration from the point of view of differential diagnosis is the double aortic arch. The author observed 18 cases of double aortic arch and is of the opinion that a differentiation can be made rather easily. On plain roentgenoscopy, the main mass of the aorta is not a particularly evident structure in double aortic arch, it being equally divided between the right and left side, whereas in the right aortic arch with left ligamentum arteriosum it is prominently visualized on the right side. T. LEUCUTIA, M.D.

Pulmonary Adenomatosis with a New Laboratory Finding. W. H. HATFIELD and JOHN E. HILL. *Am. J. Roentg.*, 1949, 62: 525.

The authors present a case of pulmonary adenomatosis in which the clinical diagnosis has been definitely confirmed by a laboratory procedure. Repeated sputum examinations before the death of the patient revealed, on smears, a number of small, circumscribed, round or oval masses of epithelial cells. The cells were fairly regular in size and shape; mitotic figures were not seen and the process appeared to be benign.

At autopsy, both lungs were in an expanded state and filled both pleural cavities. There were found several hard, shotlike, somewhat enlarged lymph nodes at the bifurcation of the trachea and at the hila of both lungs. On sectioning of the lungs the cut surfaces presented a large number of whitish tumor masses varying from 2 mm. to 4 cm. in diameter. Between these white tumor masses could be seen reddish-brown normal appearing pulmonary parenchyma. The replacement of pulmonary tissue by tumor had been so extreme that the brownish parenchyma appeared as threads between the masses. The masses were of a firm, rubbery consistency and did not retract below the cut surfaces.

On microscopic examination of the tumor structures, the alveolar elements were made up of cuboidal columnar cells which were generally arranged in a single layer along the alveolar walls. These cells showed pale translucent cytoplasm and regular vesicular nuclei placed in the basal section of the cells. There were no mitotic figures. In many areas, the lining wall of the alveoli showed innumerable papillary infoldings. The whole picture appeared to be one of reversion to an early fetal type of alveolar epithelium, accompanied by polypoid proliferation. The lymph nodes contained tissue similar to that described in the lungs.

This disease presents a pathologic picture closely resembling a pulmonary lesion appearing in sheep, which has various names such as jaagsiekte, pulmonary adenomatosis, epizootic adenomatosis, and infectious adenomatosis. The disease, as it appears in humans, is such that to date no satisfactory etiological basis has been determined. It is a hyperplasia of the pulmonary alveolar epithelium without the usual evidences of malignancy, such as an invasion of the alveolar walls or mitotic figures, but which can metastasize. FRANK L. HUSSEY, M.D.

Lipomas of the Gastrointestinal Tract. WILLIAM L. PALAZZO. *Am. J. Roentg.*, 1949, 62: 823.

The records of the Massachusetts General Hospital, Boston, since 1900 were reviewed, and 36 lipomas of the gastrointestinal tract were found. Of these, 22 were found in 12,100 autopsies, an incidence of 0.182 per cent. The tumors were distributed as follows: stomach (6), small intestine (10), and colon (20). Thirty-three were submucous in location. Only 13 gave rise to symptoms. The latter were often larger than the asymptomatic lipomas, and they were often pedunculated. The symptoms were usually those of partial or complete obstruction. Intussusception occurred in 6 (perhaps 8) of the 13 symptomatic cases. The roentgenologic findings were those of a benign tumor and were not diagnostically different from many others.

In 2 cases the surgeon could not palpate the lipomas at operation because of their softness even when their presence was known. A detailed exploration may be necessary to locate a lipoma that has been demonstrated roentgenologically.

HUGH SMITH, JR., M.D.

True and False Intrabulbar and Parabulbar Fluid-Level Formation in the Duodenum (Echte und falsche intra- bzw. parabulbaere Niveaubildungen, insbesondere Symptomatologie und Differentialdiagnose des Pseudoniveaubulbus). H. J. LEUTKE. *Fortsch. Roentgenstrahl.*, 1949, 72: 74.

By multiple roentgen examination, the author found that the variations in physiologic formations of the duodenal bulb often presented as symptoms resembling healing or florid duodenal ulcer. This was true especially of cases in which distortions of fluid level formations in the bulb were present. The author's concept of the word "niveau" means a ptotic duodenal cap, a sickle-shaped true atonic level formation in the bulb caused by an obligatory ptosis of the stomach. Its symptomatology is described and 1 case is presented.

There is another large group of so-called fluid level formations (niveaubildungen) in which there is gall bladder disease and extreme flattening of the duodenal cap with adherence of the gall bladder thereto. These so-called flattened or level bulbs are not obligatory and represent no true level formations in the duodenum as described by previous authors in case reports.

An apparent characteristic of many niveaux is a sharp, horizontal cephalad course in the paravertebral gutter with fixation between the descending retroperitoneal part of the duodenum overlaid by the gall bladder. Thus fixed, the dome of the duodenum is tightly stretched so that a false fluid level is formed. This condition is found in patients with mobile segments of the duodenum much more frequently than hitherto encountered, and never as such in false fluid-level formation in the bulb.

Usually the simple false fluid levels in the bulb are seen after cholecystectomy. Also, they may be found in well defined ulcer niches of the duodenal ulcer.

The authors, by roentgenologic examinations of the stomach and intestines, have found an incidence of 10 per cent of false fluid levels in the duodenum, in which cases the cholecystogram was positive, weakly positive, or, most frequently, negative—often gall stones were present. There was evidence that in cases of long-standing fluid levels there was at no time evidence of duodenal ulcer.

From these observations it follows that the predilection for false fluid levels occurs in long-standing chronic disease conditions, appearing much later than the symptoms of duodenal ulcer.

The differential diagnosis by roentgenologic examination is also presented by the author.

JANE C. MACMILLAN, M.D.

Sodium Tetraiodophthalicfluorescein for Intravenous Cholecystography. MARCUS J. SMITH and GEORGE E. MOORE. *Radiology*, 1949, 53: 552.

Sodium tetraiodophthalicfluorescein in doses of approximately 40 gm. per kilogram was administered by rapid intravenous injection for the purpose of contrast visualization of the gall bladder. In 13 of 25

cases studied visualization of the gall bladder was good or excellent, in 6 it was poor, and in 6 there was no visualization. In the cases of nonvisualization, the gall bladders were abnormal or the dye was not given in proper amounts. The optimum time of visualization was between 2 and 3 hours after the injection.

The toxicity of the injection was minimal; however, all of the patients had a slight flesh-pink tint of the skin for from 18 to 24 hours after the injection.

The authors state that experience is as yet insufficient to recommend the general use of this compound in cholecystography; they feel that further investigation is indicated.

HENRY C. BLOUNT, JR., M.D.

Roentgenologic Findings in Osteomyelitis Following Bone Marrow Infusions in Infants. E. CLINTON TEXTER, W. A. IRWIN, and D. N. KAUMP. *Am. J. Roentg.*, 1949, 62: 534.

In their review of the literature, the authors have been able to find only 19 cases of osteomyelitis secondary to intraosseous infusion in infants. To these they add 2 cases. The clinical and roentgenological findings in these 2 cases are reported.

The over-all risk of osteomyelitis is difficult to ascertain. Some idea of its calculated risk can be obtained, however, from the total of patients in whom osteomyelitis developed in the three large series of reported cases. Meola reported 326 cases of infusion, in none of which osteomyelitis developed; Texter and Kaump reported 383 cases of infusion with development of osteomyelitis in 2, and Heinild and associates reported 982 cases of infusion with development of osteomyelitis in 5 cases. The percentage of cases in which osteomyelitis developed is 0.41 per cent. With the use of hypertonic solutions or continuous infusions, the risk becomes much greater (6 to 13 per cent).

Intraosseous infusions are further contraindicated in the presence of severe skin or generalized blood stream infections. In none of the cases reported did the infection prove fatal, and in all cases complete healing occurred without residual change.

FRANK L. HUSSEY, M.D.

Visualization of Intervertebral Ligament Defects or Tears (Sichtbare Rissbildungen in den Bandscheiben der Wirbelsaeule). P. KROEKER. *Fortsch. Roentgenstrahl.*, 1949, 72: 1.

Without using contrast media, the author took 26 roentgenograms, and called attention to the anatomic points differentiating osteochondrosis following intervertebral disc degeneration, traumatic rupture of the disc, and secondary annulus fibrosis following spondylitis deformans.

The roentgenologic demonstration of a ruptured intervertebral ligament in the lumbar region after trauma is described in detail. One finds such changes also in osteochondritic unstable intervertebral ligaments. The splits or fissures through which the ligament is caught or crushed in a position of extension act as a small lid, and in this vacuum tissue gas is trapped (vacuum phenomenon of Knutssons). Roentgenograms illustrate this phenomenon.

These fissures are seen in osteochondritis with accompanying senile degeneration of the intervertebral ligament (Scheuermann's disease), after trauma, and sometimes in association with neuropathic arthropathies, but they are not observed after infectious processes or after vertebral fracture.

Therefore, it may be possible in the beginning of osteochondrosis, which produces only a diminution of the intervertebral space, that the cause of the diminution can be ascertained through demonstration of the fissure, especially in roentgenograms taken in extension, and an infectious cause can be eliminated.

JANE C. MACMILLAN, M.D.

The Roentgenographic Findings in Gas Infections and Phlegmon with Gas in Wounds of the Extremities (Ueber Roentgenbefunde von Gasoedemen und Phlegmonen mit Gas bie Extremitaetenverletzungen). HANS SCHLOTTER. *Fortsch. Roentgenstrahl.*, 1949, 72: 58.

Burchard, in a systematic review of the gas-forming wound infections observed during 1943 and 1944 in the last World War, describes the typical roentgenological findings of gas infection. He shows that the typical gas infection characteristically forms a feathery or fibrillary pattern of gas extending into the muscle and the puncture, or penetrating wound defect, with the symptomatology of gas infection. He also presented the differential diagnostic considerations of the symptoms.

The pathologicoanatomic findings were presented by Nordmann previously with correlation of the roentgenological picture so that the extent of the process and surgical handling can be determined readily. The study of phlegmon with gas shows a pleomorphic pattern with patchy and streaky areas of enclosed gas spreading to interstitial portions in a variety of forms that can constitute the diagnosis of phlegmon. The differential diagnosis lies between gas with phlegmon and typical gas gangrene sickness. The roentgenogram shows the location of the lesion and its course; clinically, by means of roentgenograms, the process can be shown to melt away and disappear from the extremity with treatment. This method of promptly treating the disease at its beginning and ascertaining the underlying processes is the treatment of choice and contributes to the curtailment of the disease. It is a challenge to the roentgenologist in examining and diagnosing all gas gangrene infections.

J. C. MACMILLAN, M.D.

Rotation Treatment of Cancer of the Esophagus. A Clinical Material. CARL KREBS, HOWARD NIELSEN, and POUL E. ANDERSEN. *Acta radiol.*, Stockh., 1949, 32: 304.

Rotation irradiation is an attempt to combine all the advantages of cross-fire technique with an ideal distribution of the radiation so that a high depth dose and a low skin dose might be obtained. The

authors believe that the theoretical concepts involved are very favorable for the treatment of lesions in the middle mediastinum. They calculate the depth dose obtained in the thorax, the ratio between the maximum dose and the surface dose, to be between 180 and 285 per cent.

The authors describe a new technique for rotation irradiation. They describe their method of localizing the tumor and setting up the ports. A tumor dose of from 5,000 to 6,000 roentgens is reached in from 30 to 40 days and corresponds to 15,000 roentgens in air. The treatment time is between 10 and 20 minutes each day, depending on the dose given. The patients are placed on a rotating chair in such a way that the tumor is in the axis of the chair and therefore the center of rotation. The patient's arms are placed in a specially designed, T-shaped arm rest and the body is encased in three plastic splints strapped against the chest, so that he is completely fixed. This permits treatment of even the most debilitated patients.

A focus-axis distance of 50 cm. is used. The size of the field is determined as the field in the axis of rotation, which is usually 5 by 15 cm. and the kilovoltage is 170 (with a half value layer of 0.7 mm. of copper). The tumor dose is approximately 150 roentgens at each treatment. The authors emphasize the importance of supplementary treatment, such as the administration of vitamins and blood transfusions, as a large factor in attaining a high tumor dose in debilitated patients.

Two hundred and seventeen patients suffering from cancer of the esophagus and cardia were treated as outlined. The average age of these patients was 66 years, and the duration of the disease before admission was approximately 5 months. It was found that the farther the distance the tumor was from the teeth, the longer the duration of symptoms before the patient sought medical care. The sites and histology of the tumors are discussed. Only 111 tumors were subjected to microscopic examination.

It was shown that there was slight prolongation of the average duration of life of these patients. There was a marked palliative effect. A total disappearance of tumor was seen in 20 per cent of the patients, with improvement in 44 per cent. Only 12 per cent had pain at the end of treatment. The general condition was considerably improved in 34 per cent and there was some improvement in 40 per cent; in 12 per cent there was no change. There was usually a loss of weight and this was not a good indication as to the clinical condition. It is noteworthy that in 20 per cent of all the patients it was possible to destroy the tumor locally so that no tumor was evident either roentgenologically or histologically. In spite of this many of the patients died of distant metastasis and this was thought to be due to the long interval between the first symptoms and the beginning of treatment. The public should be enlightened on these facts and should be induced to seek medical advice just as soon after the onset of symptoms as possible.

The authors also believe that with shortening of the pretreatment periods, far better palliative results, and possibly curative results, will be obtained.

JACK EDEIKEN, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Determination and Continuous Registration of the Percentage of Oxygen Saturation in Clinical Conditions. R. BRINKMAN and W. G. ZYLSTRA. *Arch. chir. Neerl.*, 1949, 1: 177.

A simple method for measuring the percentage of oxygen saturation of small blood samples is described by the authors. Their method allows rapid estimation of this factor of samples of blood and allows its continuous registration in patients.

The principle of the new procedure lies in the fact that it works not by transmission but by reflection, which has distinct advantages, namely, no hemolysis is necessary and the reflection is independent of the number of red cells in the specimen. By this photoelectric estimation of the percentage of oxygen saturation rapid determinations may be made in clinical examinations such as heart catheterization and respiratory functional tests during prolonged anesthesia, and after any thoracic surgery. The advantage of this method over other methods is its rapidity. The percentage is obtained by reading directly from a galvanometer scale.

JOHN E. KARABIN, M.D.

Observation and Interpretation of the Percentage of Oxygen Saturation During Anesthesia. L. A. BOERÉ. *Arch. chir. Neerl.*, 1949, 1: 192.

Since the development of instruments to determine the degree of oxygen saturation of the blood in vitro with accuracy, the importance of such clinical determination, especially in thoracic surgery, has been revealed. This is illustrated by the author.

The danger associated with hypoxemia during narcosis and operations has been known for a considerable time but it was difficult to ascertain the percentage of oxygen saturation without proper instruments. When clinical cyanosis is present in a patient, the oxygen saturation is already too low and correction of this state must be made as quickly as possible in order to avoid threatening dangerous anoxemia. A prolonged anoxemia may lead to irreversible damage to the vital centers of the body. The task of the anesthetist is very important, not only during the induction of narcosis but during the entire surgical operation. The author has shown that there is a marked fall in the oxygen saturation in cases of brief narcosis with pentothal only, or when pentothal is used to induce anesthesia which is continued with other narcotics. The danger of low oxygen saturation levels in cases of pentothal induction with nitrous oxide and oxygen in the proportion of 60 to 40, gives complete satisfaction of sustaining oxygenation at an adequate level.

In the cases presented, a graph of the oxygen saturation level during thoracotomy for a lobectomy, because of arteriovenous anastomosis, and in a case of thoracotomy for a mediastinal cyst is illustrated. The author points out that the oxygen saturation must be constantly observed and that the level may be low in spite of the fact that the patient shows no evidence of cyanosis. When a low level is allowed to continue any length of time, cyanosis will eventually follow.

The color of the skin, namely jaundice, has no part in the registration of the oxygen saturation according to the method employed.

The importance of continuous registration of the oxygen saturation in the cases in which low levels are already present is pointed out by the author.

JOHN E. KARABIN, M.D.

Clinical Tests of a New Coumarin Substance. A Report to the Medical Research Council. CATHERINE C. BURT, HELEN PAYLING WRIGHT, and MIRKO KUBIK. *Brit. M. J.* 1949, 32: 1250.

This article records the results of clinical tests of a new coumarin product, bis-3, 3-(4-oxycoumarinyl) ethyl acetate (referred to as B.O.E.A.). Chemically, this ester is produced by weakening the methylene linkage between the two coumarin groupings in dicumarol by the addition of a carboxyl group. Weight for weight B.O.E.A. is about four times less active than dicumarol and is prepared for clinical use in tablets of 0.3 gm. for oral administration.

Determinations were made on the average effect of a single dose of B.O.E.A. and of dicumarol on the prothrombin level in 6 subjects. After B.O.E.A. the prothrombin level reached its minimum between 8 and 24 hours and returned to normal equally as rapidly. With dicumarol, however, the minimal level was not reached for 32 hours and was maintained for a comparatively long period.

B.O.E.A. was administered therapeutically to 126 patients with venous thrombosis, pulmonary emboli, and arterial thrombosis or emboli for periods varying from 5 days to 10 months. In the majority of cases from 0.9 to 1.2 gm. of B.O.E.A. was given on the first 2 days and thereafter the dosage was regulated by response to treatment as shown by the prothrombin level and clinical signs, from 0.3 to 0.6 gm. usually proving sufficient. In cases in which an immediate response to anticoagulant therapy was necessary heparin was given in addition for the first 24 to 48 hours.

In over 80 per cent of the patients given adequate dosage the prothrombin level of the blood was reduced to under 50 per cent of normal within 36 hours of the start of treatment, and it returned to over 50 per cent of normal within the same period after withdrawal of the drug. No gross cumulative effect has been observed, although in 12 per cent of the cases the prothrombin level remained below 50 per cent of normal for periods up to 4 days after discon-

tinuance of the drug. A slow initial response was not invariably followed by a prolonged effect.

The clinical results were good in all cases except 2 in which death occurred from causes not attributable to the anticoagulant therapy. B.O.E.A. was administered on several occasions within 6 hours of operation or delivery and although it was continued for varying periods, no excess postoperative or puerperal hemorrhage was observed. No infant suckled by a mother on B.O.E.A. showed a tendency to bleed.

Apart from slight nausea and vomiting in a small number of subjects, due possibly to the bitter taste of the tablets, no toxic effects were noted. Transient hematuria, through erroneous overdosage, occurred in 1 patient, petechial hemorrhage developed in the thrombosed limb in another, and 1 patient with congestive heart failure developed hematemesis during treatment.

Thus, B.O.E.A. appears to be a step nearer the ideal coumarin substance than any so far available for clinical use. DAVID H. LYNN, M.D.

The Anterior Tibial Syndrome. A. BARHAM CARTER, R. L. RICHARDS, and R. B. ZACHARY. *Lancet*, Lond., 1949, 2: 925.

A syndrome occurring in fit young men and consisting of ischemic necrosis of the muscles of the anterior tibial compartment of the leg, with a lesion of the anterior tibial nerve, is described. In most of the published cases the onset of the syndrome can be directly related to physical exertion involving strenuous use of the leg muscles.

The salient clinical features are pain in the front of the leg, followed by signs of inflammation over the pretibial muscles and by inability to dorsiflex the foot and toes. Important negative findings are normal action of the peroneal muscles and a minimal degree of footdrop due to contracture of the ischemic muscles.

The pathogenesis of the syndrome is discussed and it is considered that the sequence of events is unaccustomed exertion causing muscle trauma that leads to swelling of the muscle fibers with increased pressure in the rigid anterior tibial compartment. This increased pressure leads to an impaired blood supply to the affected muscles with resultant ischemic necrosis. The anterior tibial nerve is involved either by compression, in which case it recovers rapidly, or by ischemia, in which case the loss of function is permanent.

It is believed that the condition can be prevented by graduated physical training. If the syndrome is recognized early, rest alone may prevent irreversible damage to the muscles; but if paralysis has developed, surgical decompression of the anterior tibial compartment as an emergency procedure is advocated. ELY ELLIOTT LAZARUS, M.D.

DUCTLESS GLANDS

The Relations Between the Parathyroid Glands and Spleen (Rapporti tra paratiroidi e milza). M. PARRA. *Ann. ital. chir.*, 1949, 26: 304.

The effect of the parathyroid hormone on the spleen can be demonstrated experimentally. Both excess and lack of the hormone in the circulation produce significant changes in the spleen. The parathyroid hormone exerts considerable influence on the vascular system, e.g., the coronary and cerebral arteries and the aorta. The hypothesis that this hormone plays a role in the genesis of Buerger's disease forms the basis of unilateral parathyroidectomy for the treatment of this condition.

Experimentation has not yet been able to clarify the situation. According to some investigators, splenectomy is followed by hypercalcemia, while others report hypocalcemia. Our knowledge of functional interrelations between the spleen and the parathyroids is extremely limited.

The author studied the effect of the parathyroids on the spleen in 2 series of experiments. In the first group of rabbits, hyperparathyroidism was produced by repeated injections of Collip's parathormone, while in the second series hypoparathyroidism was obtained by surgical removal of 2 or 3 parathyroid glands. The spleen in the last mentioned group showed hemorrhagic foci, dilatation, infarction of the capillaries, and an increase of fibrous tissue.

Similar but less pronounced changes were observed after the artificial production of hyperparathyroidism. Especially the development of connective tissue was less marked. JOSEPH K. NARAT, M.D.